ROBO 500 GRAPHICS SYSTEM

USER GUIDE

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1.0 INTRODUCTION

This section provides details of the computer hardware components needed, and the installation of the ROBO 500 System.

The information contained within this section should be read in full BEFORE trying to use the system.

1.1 SYSTEMS COMPONENTS

1.1.1 MINIMUM EQUIPMENT NEEDED

With the system you can convert an off-the-shelf Apple computer installation into a powerful drafting system simply by the addition of a single hardware and software package.

This is what is needed -

1 **An Apple IIe computer, or Apple II computer upgraded to 64K RAM ***

plus additional peripherals :-

Two Apple II DOS 3.3 disk drives with controller
Suitable Colour or Black/White Monitor

2 **The Robo 500 Graphics System comprising :-**

Controller Unit
Type 1 Interface
System Master Software Disk (2 copies)
Introductory Library Disk (for use with tutorials)
Pre-formatted Buffer Disk
Manual

also included with the system is a 'Presentation Graphics' Library Disk, which illustrates the use of the system in presentation development.

With the basic system you can generate material electronically and store it on disks. These disks can be copied and transported, they can be used for permanent storage and also to produce copies of your drawings on paper and other drafting media.

* Early 48K Apple II computers can be upgraded to 64K with a 16K RAM extender such as the Microsoft or Apple language card.

1.1.2 ADDITIONAL EQUIPMENT OPTIONS

DOT MATRIX PRINTERS

Useful for quick proofing of screen images, dot matrix printers need no additional software to work with the Robo 500 system, provided they have graphics capabilities.

DRAFTING PLOTTERS

Essential for high quality finished artwork, plotters come in a variety of shapes and sizes. Main distinguishing features are price, paper size, plotting speed, accuracy, line smoothness, number and type of pens. Driver software is available for many drafting plotters for use with the Robo 500 and is provided as a separate software product.

Note: Although the Robo 500 system can fully use the capabilities of a multi-pen plotter, you may not actually need one! Even with a single-pen plotter, you can produce finished drawings with as many colours and line weights as you wish, this is because the system allows a drawing to be built up by multiple passes with different pens on to the same sheet.

DIGITISING TABLETS

The Robo 500 system allows you to use a digitising tablet for tracing existing artwork such as maps, logos, cartoons and photos. No additional software is needed if the tablet is compatible with Robo 500.

Your basic system can be extended to provide both rapid proofs and high quality plots of your electronically generated drawings. The complete work station includes a Digitising Tablet.

1.2 GETTING STARTED

To install the system yourself follow the instructions given below. Having completed the basic set-up procedure, you can go directly to the Tutorial material in Section 2. However, if you need more information on displays, printers, plotters and digitising tablets, you will find these items covered individually in this section.

1.2.1 INSTALLING THE CONTROLLER

This requires no technical knowledge, but it does need care.

1 Make sure the computer is switched off.

2 Remove the computer cover, pull up the rear edge to release the fasteners, then slide back until free.

3 Install the Type 1 Interface module into the 16-pin connector (game paddle I/O) at the right rear corner of the computer main circuit board. Before you plug it in, check that the pins are straight and aligned with the socket, and make sure the white marker is toward the front of the computer (Figs 1 or 2).

4 Install the 16-pin plug on the Controller lead on top of the Interface module. Before you plug it in, check that the pins are straight and aligned with the sockets on the Interface. Orientate the cable as shown in Fig 1 or 2 below.

5 Identify the 4-pin auxilary video connector on the main circuit board, and install the single wire breakout on the 12 volt pin, the position of this depends on the version of the computer you are using (Figs 1 or 2).

6 Replace the cover on the computer, front first, then press down on the back corners.

PLEASE!

CHECK EVERYTHING AS YOU GO, AND DO NOT BEND THE PINS

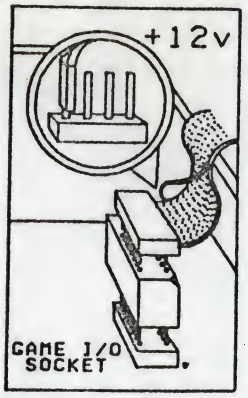


Fig 1 - Apple II

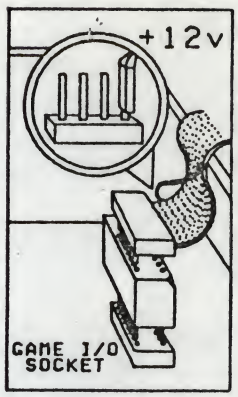


Fig 2 - Apple IIe

Replacement Type 1 Interface

The Type 1 Interface supplied is an essential part of the Robo 500 system. If the system fails to function properly, and if the computer hardware is in good order, the fault may be in Type 1 Interface. Please return it with dated proof of purchase to Robocom Ltd., packed to avoid damage to the connector pins. Provided the Interface has not been damaged by improper use, it will be replaced free of charge within the warranty period of 90 days from the date of purchase.

After the 90 day warranty period the interface will still be replaced, but at a small charge to cover administrative costs.

1.2.2 INSTALLING 16K RAM EXTENDER CARD - APPLE II ONLY

Before doing anything **make sure the computer is switched off!** The extender card is usually installed in the leftmost interface slot marked 0 on the computer circuit board. It can be inserted only one way, with components facing right. Some extender cards require additional connections, so refer to the manufacturers' instructions.

1.2.3 INSTALLING INTERFACE CARDS

The Apple disk drives, and other peripheral equipment used with the computer, require interface cards to be installed on the main circuit board. Before doing anything, **make sure the computer is switched off!**. In all cases, **please read the manufacturers' instructions.** Each interface card must be installed in its appropriate slot for use with the system, as follows:-

Slot number	Interface card
0*	16K RAM extender/language card (Apple II only)
1	Printer interface card
2	Plotter interface card (e.g. Super Serial Card)
3	Free
4	Graphics tablet interface
5	Free
6	Disk drive controller card (Apple)
7	Colour video card

* Slot 0 is at the left, viewed from the front (keyboard side) of the computer.

Note: The system can be used with the 'Accelerator' Card for enhanced performance. Install the card in any free slot.

1.2.4 SOFTWARE AND DISK VOLUMES

The Robo 500 package includes five disks.

1 Two copies of the system software, labelled SYSTEM MASTER. One copy is intended for immediate use and the other is a back-up copy. The back-up copy should be stored carefully in a clean, dry environment clear of strong magnetic fields and other hazards.

2 One INTRODUCTORY LIBRARY disk containing various pre-drawn examples for use with tutorial exercises. MAKE BACK UP COPIES OF THIS DISK BEFORE USING IT IN THE TUTORIALS.

3 One PRESENTATION GRAPHICS LIBRARY disk.

4 One pre-formatted BUFFER disk, used as overflow memory.

To use the system another kind of disk volume, the ARCHIVE disk is normally required, which must be created by the user of the system.

The different disk types have different purposes, as follows :-

The BUFFER disk, is used as a work disk by the system during the drawing process, and must be available in disk drive 1.

ARCHIVE disks, a special type of Library disk, are used to 'file' completed work which is no longer required in an 'on-line' Library.

LIBRARY disks similar to the Introductory Libraries but on separate disks, required to store your drawings as you generate them. (Pre-drawn library disks, containing commonly used symbols and other graphic material, are available from your dealer).

Creating these disks is described in detail in Section 3, but the minimum needed to try the system and the tutorial exercises, is supplied with the system.

DISK SECURITY - MAKING BACK-UP COPIES

Two copies of the SYSTEM MASTER disk are supplied, a working copy and back-up, as the disk cannot be copied. Care should be exercised when handling these disks, and the back-up copy should be stored in a safe environment.

Copies of any Library or Archive disks, including those supplied with the system, can be made using the standard Apple DOS 'COPYA' program. Ensure any disks containing work generated using the system are backed up at regular intervals. It is recommended that two back-up copies are maintained for each disk, and used alternately. In this way, should any problem occur, three 'generations' of each disk are available; current work version, previous back-up version, and oldest back-up version.

The system uses standard 5 1/4 inch single-sided, single-density floppy disks. Although any compatible disk may be used, the better quality disk is a good investment in the long run.

Caution!: DISK HANDLING Floppy disks can easily be damaged by improper handling. NEVER remove a disk from a drive which is still running (RED light ON).

Replacement Copies of Systems Software

Robo 500 software is protected to prevent unauthorized duplication. A back-up copy of the system software is provided in case the original disk becomes damaged. If the software fails to load properly at start up **please do not** check the system disk by substituting the back-up copy, check first with your dealer. The most likely cause of difficulty ia an improperly installed disk or a disk drive malfunction which would also damage the back-up disk.

If the system disk found to be defective, return it to Robocom Ltd. with the dated proof of purchase. Provided the disk has not been damaged by improper use, it will be replaced free of charge within the warranty period of 90 days from the date of purchase.

After the 90 day warranty period the disk will still be replaced, but at a small charge to cover administrative costs.

Please use card stiffeners to avoid shipping damage.

1.2.5 STARTING THE SYSTEM

Before proceeding to the next stage of setting up the system hardware, you must first load the System Master software into the Apple computer.

1 Start with all the equipment switched off.

2 Insert the SYSTEM MASTER disk in Drive 1.

3 Close the disk drive flap.

4 Switch the monitor on.

5 Switch the Apple computer on (switch at left rear), and disk drive red light will go on and the software will be read into the computer. On the screen you will see a title page followed by a list of options titled 'SYSTEM MENU', as shown below :-

```
1    RUN GRAPHICS SYSTEM

2    FORMAT LIBRARY DISK
3    FORMAT ARCHIVE DISK
4    FORMAT BUFFER DISK

5    SET UP CONTROLLER
6    SET UP PRINTER
7    SET UP DIGITISER
8    EXIT
```

6 Please read and continue with the next section before doing anything else if this the first time the system is being used, as it must be configured for your installation.

7 Otherwise, for normal use, select RUN GRAPHICS SYSTEM option and press the RETURN key.

8 You will be prompted to load a Library Disk into Drive 1 and a Buffer Disk into Drive 2 (load the Introductory Library Disk if you wish do the tutorial exercises).

9 Load the appropriate disk volumes as requested and press the RETURN key.

1.3 TRIMMING THE CONTROLLER

Although the Controller was accurately calibrated at the factory, component values within the computer can vary slightly. This may cause variations in resolution of the three control axes, but is taken care of very simply by adjusting the trimmers on the underside of the Controller.

This is a **one-time procedure** which should not need to be repeated so long as the Controller remains connected to the same computer. Please adjust the trimmers only in the following strict sequence, using the tool provided or a small blade screwdriver.

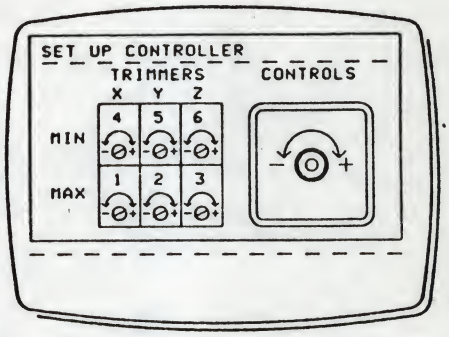


Fig 1 - Controller trimming display

1 **Select Option 5 from the System Menu (press '5' then the RETURN key, on the computer keyboard).**

2 **The screen display at the left depicts the trimmers as seen from the underside of the Controller, and the right display represents the control axes viewed from above, the two lines of text at bottom of the screen tell you what to do, with keywords displayed black-on-white (Fig 1).**

3 **Now follow the screen prompts to complete the trim program, pressing RETURN after each 'OK'.**

Caution!: Make adjustments only in very small steps. The correct general procedure is to achieve the 'OK' state as the axis control just reaches its prescribed limit of travel.

When you have trimmed the Controller, the system is ready for use. You may proceed to the Tutorial Section 2, to start drawing, but if you have an extended system, with additional peripherals continue with this section.

1.4 VIDEO MONITORS

There are a wide range of video monitors available which can be used with the system.

For professional use, important features are stability of the display, freedom from distortion and the colour quality. For prolonged viewing, monitors are always preferable to TV receivers.

Listed below are the main types of display, starting with the least expensive.

1 Monochrome TV, using an RF modulator, which plugs into the Apple computer.

2 Monochrome video monitor which plugs into the video output socket of the Apple computer. It is better than (3) for technical line work, unless you really need colour.

3 Colour TV, using an RF modulator, as (1). In Europe, a TV receiver used with the Apple II (but not IIe) also needs a PAL colour card installed on the computer.

4 Composite colour video monitor, which plugs into the video output socket of the Apple computer. In Europe a composite colour monitor used with Apple II (but not IIe) also needs a PAL colour card installed in the computer.

5 RGB colour video monitor, which requires an RGB interface card installed in the computer.

6 Video projectors, which can be used with great effect for demonstrations and classroom projects. Available in many sizes and types, monochrome, composite colour video and RGB.

1.5 DOT MATRIX PRINTERS

Dot matrix printers, provided they are equipped with graphics facilities, can be used to 'dump' the screen image onto paper. Many makes and types of printer are suitable, but each requires a specific interface card to be installed in Slot 1 of the Apple computer. You will also need a connecting cable specific to your printer/card combination (the cable may be supplied with the interface card - if not your Apple dealer will help).

Some special switch settings may be required, as detailed in the printer and interface documentation. Additionally, the system has to know which card you are using, so it can communicate with the printer. This is one-time operation, as follows.

1 Make sure the computer is switched off.

2 Carefully remove the 'write protect' tab from the System Master disk.

3 **Insert the System Master into disk drive 1.**

4 **Switch the computer and video display on.**

5 **When the System Menu appears, select Option 6 'SET UP PRINTER' and a list of interface card types appears.**

6 **Select the required option, followed by RETURN key, and the software will automatically be set to the type of interface chosen. Then the System Menu will re-appear when complete.**

7 **Remove the System Master Disk and replace the Write protect tab. Replace it in Drive 1 when this is done.**

8 **The system is now ready to continue.**

Note: Certain printer interface cards provide various options when printing screen images. Image enlargement, rotation or inversion is often possible. Refer to the interface card user guide for details of any options available.

The appropriate control codes which may be required can be specified to the system by selecting 'User Configured' on the 'SET UP PRINTER' option.

1.6 DRAFTING PLOTTERS

Plotter software

Drawings produced electronically by the system can be converted into plotted hard copy output. For this you will need a suitable precision plotter **and the appropriate plotter software disk.**

This software provides many advanced functions including scaling, colour and line type assigment, and the ability to select any detail of the drawing and position it anywhere within the plot area. Software is available for several types of drafting plotters.

As with printers , an interface card and cable is required. The interface card should be installed in Slot 2 of the computer, and several switches on both card and plotter need to be correctly set. Documentation supplied with the plotter software includes full set-up information. For details on the range of supported plotters, consult your dealer.

1.7 DIGITISING TABLETS

If you intend to use a tablet, the software must be instructed accordingly. This is a one time operation, as follows.

1. Make sure the computer is switched off.
2. Carefully remove the write protect tab from the System Master disk.
3. Insert the disk into Drive 1.
4. Switch on the computer and video display.
5. When the System Menu appears, select Option 7 'SET UP DIGITISER' and a list of tablet types is shown.
6. Follow the screen prompts to confirm your choice of tablet, the software is then automatically set, and the System Menu will re-appear.
7. Remove the System Master disk and replace the write protect tab.
8. Return the disk to Drive 1, and you are ready to continue with system choices.

2.0 INTRODUCTION

This section of the manual is a series of hands-on tutorials on the System.

It is assumed here that the hardware components are connected and functioning properly (refer to Section 1).

The System is powerful and comprehensive, with capabilities usually found only in dedicated CAD systems. However, there is one key difference, the system is easy to use! A few hours of practice with the tutorials will teach you the system's basic functions, showing you just how easy it can be to produce useful, impressive graphics. Although we call these functions 'basic', we think you'll be surprised by their potential.

Don't be afraid to experiment with the system, it costs very little to erase mistakes! Your artwork is created - and modified - electronically, and nothing is committed to paper until you are absolutely satisfied.

There are ten tutorials concerned with basic functions and advanced features needed for precision drawing. The last tutorial, eleven, covers various 'ad hoc' topics and techniques.

Each tutorial is self contained and learning sessions can be broken between tutorials. However, exercises within tutorials, showing different features, assume that previous material created is still available for further exercises, so organise your learning periods based on complete tutorials.

Each tutorial begins with a brief introduction indicating the functions covered within it.

2.1 TUTORIAL 1

Tutorial 1 introduces basic topics, and shows how to begin using the system.

- The Controller and how to use it
- The Work Page screen display
- Making Menu selections
- Making Palette selections

2.1 STARTING THE TUTORIALS

If you are starting the tutorial exercises without having previously dealt with the Robo 500 System, or Section 1 of this manual, here a few points to note before you start.

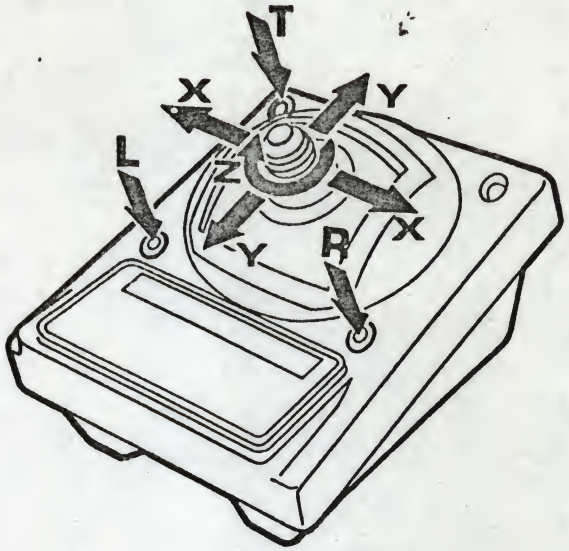
The system software is supplied on a floppy disk labeled 'System Master', which contains the graphics system program.

An Introductory Library Disk is supplied with the system for use with tutorials. A formatted Buffer Disk is also supplied.

Now follow the instructions in Section 1 on starting the system. Continue with this tutorial once the system is ready.

2.1.2 THE CONTROLLER

The Controller is designed to be used as an extention from the computer console, so you can make yourself comfortable and concentrate on the screen. Try to operate the controls by touch, keeping your eyes on the screen, and you will soon be using the Controller as proficiently as you would a pencil. Controller commands are summarized below.



The Controller

CONTROLLER COMMANDS

The Controller is designed to provide a wide range of command inputs with only a small number of controls. In general, the controls function as stated below.

The stick, denoted **XY**, controls position during drawing by up/down, left/right or diagonal movement.

The knob, denoted **Z**, controls scale, rotation and proportion ('stretch') by rotating it.

Left button, denoted, **L** confirms a selection

Right button, denoted **R**, generally provides a 'release' function

Top button, denoted **T**, executes a command

For example - Two frequent actions required

Press **L** and **R** buttons at the same time to escape from the Menu functions.

Clear the screen by selecting WIPE on the menu, then pressing **L** and **T** buttons at the same time.

CONTROLLER OPERATING TIPS!

Use one hand for 'stick' and control knob movements, and the other for all button presses.

The buttons are usually operated by a **press and release** action, although sometimes you will have to **press and hold** a button.

When a press and release action is used, the system accepts the instruction only when the button is **released.**

The following abbreviations are used thoughout the Tutorials concerning the Controller.

Move XY	Move stick as indicted in tutorial text
Rotate Z	Rotate Z Control Knob
L	Left button
R	Right button
T	Top button
L and R	Left and Right buttons at the same time
L and T	Left and Top buttons at the same time
origin cursor	The term 'origin cursor' is used to denote the 'x' shaped cursor which defines start point when drawing.
dynamic cursor	The term 'dynamic cursor' is used to denote the '+' shaped cursor which defines end point when drawing.

2.1.3 ON THE SCREEN

Once the system software has been loaded into the computer, you will see a list of items down the right side of the screen, called the Menu, and groups of items in a line along the bottom, called the Draw Palette. See (Fig 1).

The main area of the screen is called the Work Page - this is where you do your drawing. On the Work Page you will see a 'x' and an '+' joined by a line.

These are the Origin and Dynamic Cursors. With the cursors, which you can move around with the Controller, you can create your drawing on the Work Page, and you can make selections from the Menu and Palette.

The line connecting them, which stretches and contracts as the Dynamic Cursor is moved, indicates where the actual line would be drawn and is called a 'rubber band' (for obvious reasons). It is especially helpful when drawing arcs, as you will see. The system provides other palettes and menus, which are described later in the tutorials.

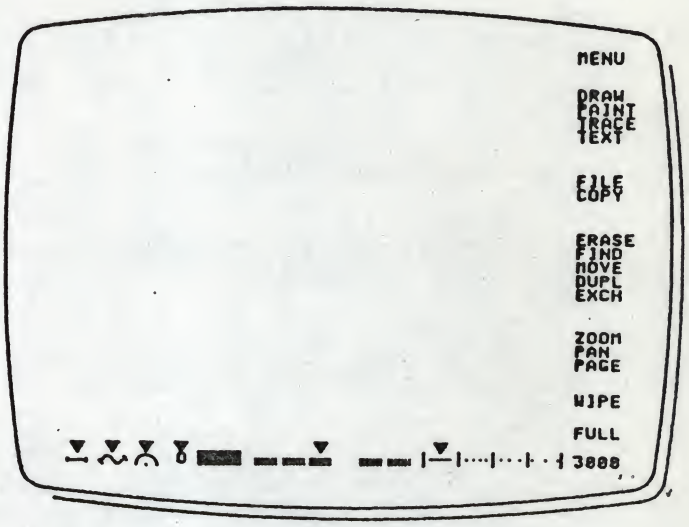


Fig 1

Note: The menus, palettes, and your drawings themselves, are Usually white on a dark background when on the screen. However, throughout the tutorial text illustrations are shown as black on a white background.

BLACK ARTWORK - WHITE SCREEN IMAGE!

2.1.4 MENUS

Major functions are selected or commands are given to the system by using the Controller XY movement to pick a function from the Menu down the right side of the screen.

MENU 1	MENU 2
MENU	MENU
DRAW	0.90
PAINT	
TRACE	8X8
TEXT	4X4
	POINT
FILE	
COPY	LOAD
	EDIT
ERASE	
FIND	FIND
MOVE	
DUPL	CLEAR
EXCH	SAVE
	VIEW
	PRINT
ZOOM	LIST
PAN	
PAGE	PLOT
	EXIT
WIPE	
FULL	FULL
3888	3888

Fig 1

Using the menu is very easy! All menu selections are made with the Controller, and there's no need to touch the computer keyboard.

1 Move XY to move the dynamic cursor to MENU (top right corner), and a flashing white box appears around the word MENU. Hold the stick there for now.

2 Press and release L to confirm your selection, and another MENU will appear (this is Menu 2, which you will use in later tutorials).

3 Move XY to the left, away from the MENU flag to get the cursor back within the Work Page.

4 Move XY to MENU, then confirm by press and release L to return to Menu 1.

5 Move XY away from the MENU flag to get the cursor back on the Work Page. Notice that the DRAW function is selected automatically on moving into the Work Page.

For the moment DO NOT try making selections from either MENU! Each function is described separately in the following pages.

MEMORY COUNTER

In Fig 1, at the bottom of Menu 1 is a four digit number. This is the MEMORY COUNTER. The count reduces as your drawing develops, indicating the amount of computer memory remaining for your drawing. You'll hear an AUDIBLE BEEP when the memory is nearly full!

At that point, when drawing for real, you would FILE your drawing (Sect 2.2.6), clear the screen using WIPE (Sect 2.2.4), which will reset the counter, then COPY your drawing (Sect 2.2.7) and continue.

Filling memory takes a lot of drawing detail and will not happen during these tutorials, so just remember the above procedure and note the effect on the MEMORY COUNTER as you use different drawing functions in the tutorials.

2.1.5 PALETTE

Using the palette at the bottom of the screen is just as simple. As with the Menu, all selections are made with the Controller.

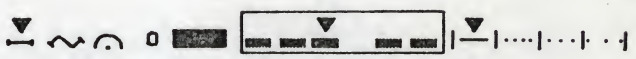


Fig 1

1 Move XY to aim the dynamic cursor at any of the colour blocks in the middle of the palette (Fig 1).

2 Move XY to move the dynamic cursor vertically down to the bottom of the screen, through the chosen colour. The white triangle will jump to the chosen colour and you will hear a beep.

3 Move XY to move the origin cursor straight up (if you nudge the triangle you will make another colour selection). If you do this by accident just repeat the actions to reselect your chosen colour.

The product described in this manual and products for use with it, are subject to continuous development and improvement. All information of a technical nature and particulars of the product and its use (including the the information and particulars in this manual) are given by Robocom in good faith. Robocom welcome comments and suggestions relating to the product and this manual.

All maintenance and service on the product must be carried out by Robocom authorised dealers. Robocom can accept no liability whatsoever for any loss or damage caused by service or maintenance by unauthorised personnel. This manual is intended only to assist the reader in the use of the product, and therefore Robocom shall not be liable for any loss or damage whatsoever arising from the use of any information or particulars in, or any error or omission in, this manual, or any incorrect use of the product.

Other selections can be made from the palette in a similar way. You don't need to press any buttons to confirm a selection. To escape from a particular palette selection, you simply choose something else from the palette.

Try selecting various different items from the palette to see what happens, and then return the screen to its original state before you continue by following the instructions below.

Fig 2

1 Select the symbol marked 1 in Fig 2, from the bottom left corner of the palette. This selects the straight line mode.

2 Select the symbol marked 2 in Fig 2, from the middle of the palette. This selects the white line drafting mode.

3 Select the symbol marked 3 in Fig 2, from the right of the palette. This selects the continuous line mode.

Often in these tutorials you will be asked to draw in 'continuous white line', this means that both (2) and (3) must be selected, together with whatever line shape (straight, curve, circle, etc) you need.

Fig 2 shows the palette selections grouped under the four different categories, Line Shape, Nib, Line Colour, and Line Type that you will deal with in more depth in later tutorials. Just note the names and grouping for now.

Caution!: Keep an eye on the palette (and an ear open) while you are drawing, otherwise you might accidentally change your palette selection.

2.2 TUTORIAL 2

Tutorial 2 introduces the basic functions necessary to carry out any drawing task and you will actually begin to draw with the system. Functions covered are summarised below.

Drawing with lines

Erasing incorrect lines

Filing a drawing onto a disk

Redisplaying a drawing after making alterations or erasures

Resetting the system by wiping out the drawing

Storing and retrieving pre drawn units from a Library Disk

Erasing incorrect Library Units copied into a drawing

2.2.1 DRAW

Ensure the screen is in its original state ... DRAW on the main menu, and straight, white continuous lines on the palette. (This is also the start condition when the Menu is first loaded). You can change these selections anytime, but leave them as they are for now and try this quick exercise.

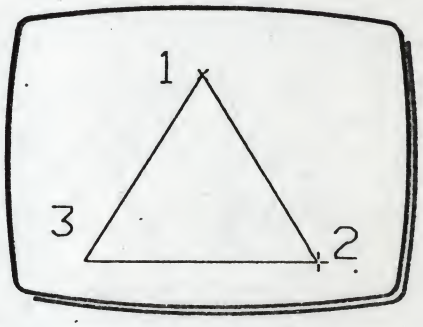


Fig 1

To Draw a triangle!

1 **Move XY to move the dynamic cursor to (1) in Fig 1.**

2 **Press and release L to position the origin cursor.**

3 **Move XY to move the dynamic cursor to (2) in Fig 1.**

4 Press and release T to draw the line.

5 Move XY to move the dynamic cursor to (3) in Fig 1.

6 Press and release T to draw the line.

7 Return the dynamic cursor to (1) in Fig 1.

8 Press and release T to draw the line.

2.2.2 ERASE

If you make a mistake at any point, you can use ERASE to remove the incorrect line. Using L or R lets you go through each entry drawn, in sequence, to select the one to erase. Let us use the triangle just drawn to show this.

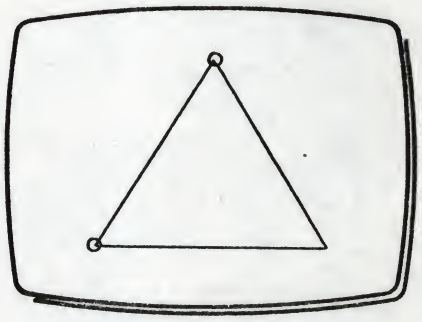


Fig 1

1 Select ERASE from Menu, then press and release L, and two small diamond shaped cursors mark the ends of the last line entered.

2 Press and release L several times to step BACK through your drawing sequence.

3 Then press and release R several times to step FORWARD through the sequence.

4 Press and release T to erase the line marked with the cursors, and the selected line is removed from the display.

5 Press and release L and R together, to exit ERASE and return to DRAW.

2.2.3 PAGE

How to clean up your drawing!

After using ERASE on complex drawings, you may see pieces missing from your drawing on the screen. This is because lines are erased by overdrawing in black. To show this, draw several HORIZONTAL and VERTICAL criss-crossing lines, using what you have just learnt, then ERASE some of them.

TRY THIS ON YOUR OWN NOW!

Gaps will appear, but this is a display effect only, which you can eliminate simply by selecting, PAGE from the Menu then press and release L. Your drawing will replay on the screen without gaps.

TRY SELECTING PAGE NOW AND WATCH YOUR DRAWING REDRAWN ON THE SCREEN

PAGE can be used anytime to replay the contents of the screen memory.

2.2.4 WIPE

If you wanted to remove all the drawing in memory in one go ERASE is not very useful, as it only does one entry at a time. To remove **all** entries made currently in the memory you must use WIPE. This resets the system and forgets all the previous entries.

Caution!: WIPE is an instant eraser - it takes out everything on the screen at once,so use it with care.

Lets try removing all the entries we have made so far.

1 **Select WIPE from the Menu.**

2 **Press and release L and T together to confirm, and the screen display and counter clears.**

3 **Move XY away from WIPE to return to the DRAW function.**

2.2.5 LIBRARY DISKS AND LIBRARY INDEX

The Library Disk, with its Library index of miniature drawings, is one of the most powerful features of the system.

Drawings can be transferred to and from the Work Page at will, using the FILE and COPY functions. They can be endlessly modified, manipulated and re-used time and again - singly or in any combination,

On the Library Disk are three index pages, A, B and C, each with a number of boxes for miniatures of the drawings stored on the disk. Each index can be formatted with a different number of boxes so that a drawing can be stored according to the complexity of index display detail you require.

The following information and exercises show how the Library feature works, and how it is used.

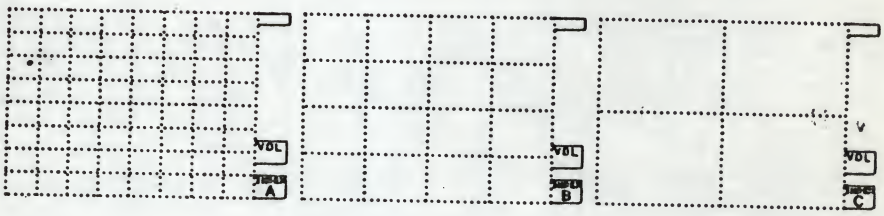


Fig 1 - The three index pages of the Introductory Library

Use the Copy function to view the contents of the Library Disk Indexes

1 Clear the screen using WIPE.

2 Select COPY from the Menu, then press and release L to confirm, and the Work Page will be replaced by Library Index A, which looks like a mosaic of minature pictures. The pictures are pre-drawn material provided as part of the Introductory Library.

3 Press and hold R until disk drive whirrs, then release R. Index A is replaced by Index B.

4 **Repeat to view Index C.**

5 **Press and hold L to step back to Index A.**

6 **Press and release L and R together to exit from COPY.**

Note: Selecting indexes can be done with either L or R depending on the direction required, but the buttons must be held down until the direction is sensed by the system.

```
            Right Button
          --------------->
INDEX A        B        C
          <---------------
            Left Button
```

FILING DRAWINGS IN THE LIBRARY AND RETRIEVING THEM

You can file the Work Page drawing on the screen to an empty box on a Library disk at any time. A drawing filed in this way is known as a 'Library Unit'.

The Work Page can be filed at any stage of completion, and it can be any kind of drawing; original material just drawn by you, or a composite drawing assembled from original material plus other library units.

A drawing stored as a Library Unit and subsequently copied into other drawings is treated by the system as a single entity, irrespective of the number of original entries made to create it. For example, a unit can only be erased completely, not partially.

For normal use of library units during drawing, the functions FILE, COPY, EXCH, and DUPL are used. However, where a Library unit has to be retrieved in its original form, for example to modify it; special utility functions, LOAD and EDIT, are provided. All these functions, and how to use them, are covered in this, or subsequent tutorials.

As well as being used in the drawing process, the Library function is also used as the normal means of storing your own completed drawings, either on normal Library disks or on Archive disks. When you are creating a drawing remember to reserve space to file your completed drawing and use it to retain interim versions while drawing.

Filing, or 'backing up', is something you should do routinely every half hour or so. A power failure, a power glitch or accidental interference by someone else can destroy hours of original work.

BACK-UP YOUR DRAWINGS TO THE LIBRARY EVERY 30 MINUTES OR LESS!

2.2.6 FILE

Once you have completed a drawing, you can place a version of it on to the Library Disk, thus creating a library unit. This function is called FILE on the Menu, and is not the same as the COPY function; which is used to retrieve a library unit.

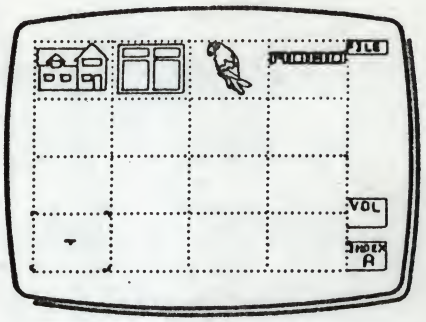


Fig 1

1 Draw a triangle as you did in the previous exercise.

2 Move XY to select FILE from the Menu, then press and release L to confirm. The Work Page will be replaced by the LIBRARY INDEX, which looks like a mosaic of miniature pictures in boxes (see Fig 1). The cursor changes to to an outline framing a box. Notice that the volume number and index page letter are shown for identification.

3 Move XY to move the cursor frame to an empty box.

4 Press and release T to file the drawing in the box. A miniature of your drawing will appear in the box.

5 You will be asked to give it a name. Ignore this 'ENTER LABEL' prompt for the moment.

6 Press and release L and R together to return from the library index, and your original Work Page will reappear.

You can now continue drawing on the page, or you can WIPE the screen to be ready for the next job. Now that you have filed the drawing, WIPE is not catastrophic! The drawing disappears from the screen, but isn't lost forever, you can recover it in two ways, both shown in later tutorials, (COPY 2.2.7 and Editing 2.7)

Caution! When using FILE, make sure the cursor frame is on an empty box before confirming with T. This is because FILE will overwrite other material already in the Library, just like a tape recorder, if you choose to do it by using a box already occupied.

2.2.7 COPY

You can copy drawings from the Library Index on to the Work Page anytime using COPY. The drawings are handled as complete library units. You can also adjust the size and orientation of a library unit to suit the particular drawing you are doing by using the Copy Palette.

1. Clear the screen (select WIPE from the Menu, then press and release L and T together).
2. Select COPY from the Menu, then press and release L, the Work Page will be replaced by the Library Index.
3. Move XY to move the cursor frame to your selected unit (use your triangle).
4. Press and release T to select the drawing. The Work Page will reappear blank, but with the cursor changed to a frame set to Work Page size. Press and release T and the chosen unit (your triangle) is drawn on the Work Page. (You may have to rotate Z to see the corners of the frame).
5. Note the new palette at the bottom of the Work Page (See Fig 1).

SCL 100.0 ROT 0 STR 50.0 X FLIP Y |—|

Fig 1

You will have noticed that COPY calls up a different palette at the bottom of the screen (see Fig 1).

The labels SCL, ROT and STR are shown on the Palette. The numbers next to the palette labels will change as you alter the size, rotation, or stretch of the cursor frame. Read the information below to see what each one means.

SCL Indicates the scale of the copied library unit as a percentage (100 = full size).

ROT Displays the rotation of the copied library unit in the range 0 to 360 degrees, in 5 degree steps.

STR Displays the proportion (i.e. stretch or squeeze) of the copied library unit, on an scale from 0 to 100, the unmodified state is 50.

You can lock any of the above numbers at a chosen setting simply by touching the required label with the centre of the cursor frame - one touch to lock, and again to unlock. The locked state is shown by a white triangle over the label.

In a similar way you can switch on and off other COPY functions which affect the copied library unit when you plant it. These functions are FLIP, Line Colour change, and Line Type change which are covered in later tutorials.

2.2.7 COPY (contined)

As has just been described, you can copy drawings from the Library Index onto the Work Page anytime using SCL, ROT and STR. The following exercises show you how to do this in a complete sequence.

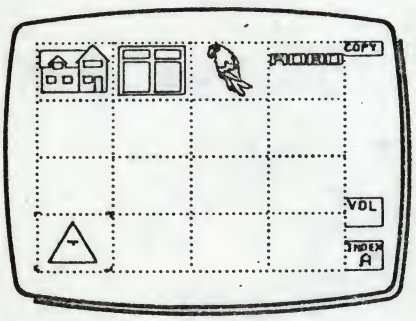


Fig 1

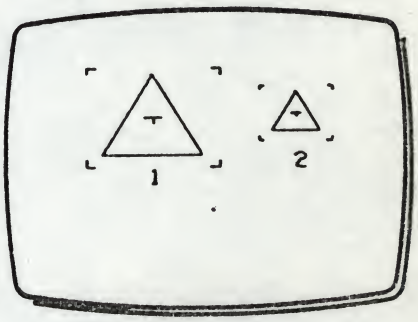


Fig 2

COPY

1 First clear the screen (select WIPE from the Menu, then press and release L and T).

2 Select COPY from the Menu, then press and release L. The Work Page will be replaced by the Library Index (Fig 1).

3 Move XY to move the cursor frame to your selected drawing (use your triangle again).

4 Press and release T to select the drawing, and the Work Page will reappear blank, but with the cursor frame at page size.

SCALE

1 Rotate Z to alter the cursor frame size. Rotate it fully in each direction the obtain the full scale range,(notice the changing value of SCL).

2 Move XY to position the cursor frame at (1) in Fig 2.

3 Press and release T to draw the library unit.

4 Rotate Z to alter the size again.

5 Move XY to position the cursor frame at (2) in Fig 2.

6 Press and release T to draw the library unit at the new size.

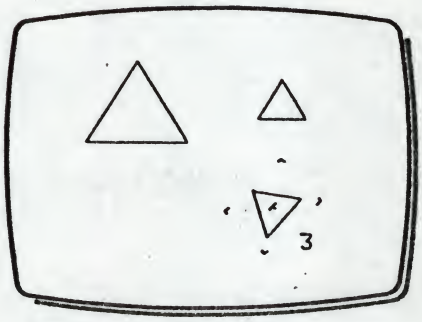


Fig 3

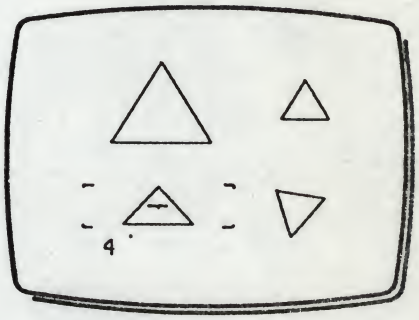


Fig 4

ROTATE

1 Press and hold L, and rotate Z to rotate the cursor frame (notice the changing value of ROT).

2 Release L when you have the required rotation.

3 Rotate Z to alter the size, and move XY to position the cursor frame at (3) in Fig 3.

4 Press and release T to draw the library unit.

5 Press and hold L and rotate Z to return the cursor frame to its original orientation, (ROT 0).

STRETCH (proportion)

1 Press and hold R then rotate Z to stretch or squeeze the cursor frame (notice the changing value of STR).

2 Release R when the cursor frame is proportioned as (4) in Fig 4, then rotate Z to alter the size, and move XY to position the cursor frame at (4).

3 Press and release T to draw the library unit.

4 Press and hold R and rotate Z to return the cursor frame to its original proportion (STR 50).

Note: If you wished to remove a copied unit you would use ERASE, which is covered in the next tutorial.

MULTIPLE DRAWING OF THE SAME LIBRARY UNIT

With the COPY function and repeated operations of the T button, you can plant as many copies of the library unit as you like using scale, rotation and proportion in any combination.

TRY PLANTING MORE UNITS, FROM WHAT YOU HAVE LEARNT ABOUT COPY!

2.2.8 ERASING COPIED LIBRARY UNITS

If you wish to remove a library unit which you transferred to the Work Page from the Library, you use the ERASE function in a new way.

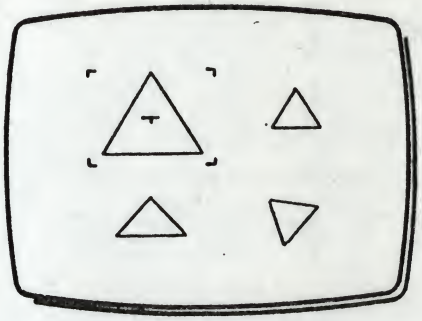


Fig 1

1 Select ERASE from the Menu. Use the centre of the cursor frame to make the selection if you are still in COPY.

2 A flashing frame marks the last library unit planted on the screen.

3 Press and release L to step BACK through the planting sequence.

4 Press and release R to step FORWARD through the planting sequence.

5 When you arrive at a library unit you wish to remove, press and release T to erase it, as in Fig 1.

6 Press and release L and R to return to COPY.

EXIT FROM COPY

To exit from COPY, since you have completed the tutorial, press and release L and R together.

2.3 TUTORIAL 3

This Tutorial introduces some additional functions shown on the Draw Palette.

Drawing Circles

Drawing Ellipses using library units

Changing Line Colour

Changing Line Type

Filling in areas of drawings with 'Paint'

How to do simple animated drawings

Locating a Point

2.3.1 CIRCLES

Circles can be drawn in a single step by selecting the circle drawing cursor from the Draw Palette.

Fig 1

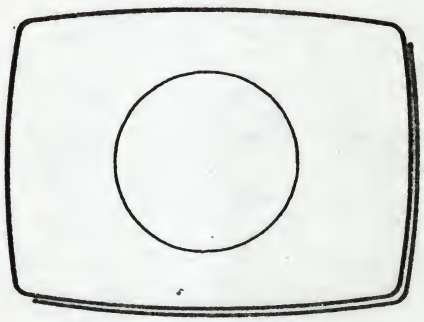


Fig 2

1 First, clear the screen using WIPE.

2 Move XY away from the WIPE label to return to the DRAW function.

3 Select the symbol marked (1) in Fig 1, from the palette.

4 Move XY to move the cursor vertically back up into the Work Page. The cursor itself is now a circle under XY control.

5 Rotate Z to alter the size of the circle.

6 Press and release T to draw the circle (Fig 2).

7 Move XY to make the circle visible.

If you wish to remove a circle, use the ERASE function.

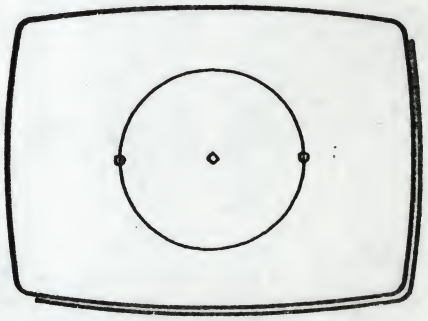


Fig 3

1 Select ERASE from the Menu using the centre of the circle to make the selection.

2 Press and release L to confirm.

3 Two small cursors will mark the circumference of the circle and a small diamond will mark the centre of the circle (Fig 3).

4 Press and release T to remove the circle.

5 Exit ERASE by press and release L and R together.

Note: If you have more than one circle on the screen, you can press and release L or R go to each one to select the circle to be erased.

2.3.2 ELLIPSES

You can generate perfect ellipses, with Copy Palette functions, by squeezing circles copied from the Library.

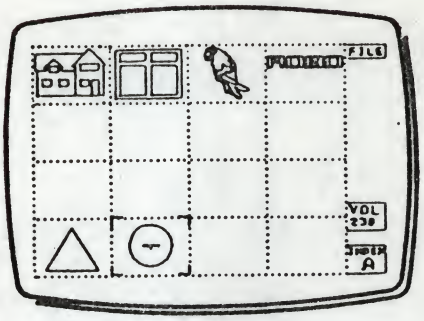


Fig 1

1 Clear the screen using WIPE and draw another circle.

2 Select FILE from the Menu using the dot in the centre of the circle cursor to make the selection, and press and release L to confirm.

3 Press and release T to file your circle in an empty library box (Fig 1).

4 Press and release L and R together to skip the request for labelling.

You can now use this stored circle to generate an ellipse.

1 Clear the screen using WIPE.

2 Select COPY from the Menu.

3 Move XY to position the cursor frame over the box containing your circle.

4 Press and release T to select it, and the Work Page will re-appear.

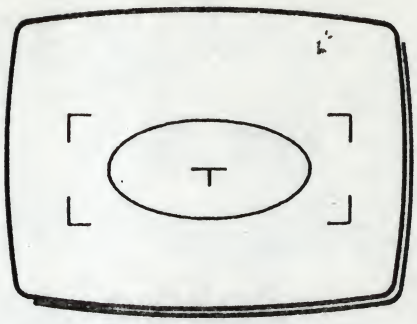


Fig 2

5 **Move XY to position the cursor frame and rotate Z to size it.**

6 **Press and hold R and rotate Z to squeeze the cursor frame.**

7 **Release R when the frame is proportioned as in Fig 2.**

8 **Press and release T to draw the 'squeezed circle', as a perfect ellipse.**

9 **Press L and R to exit COPY.**

Using just the one stored circle in different proportions, sizes and rotations, you can produce any ellipse you like. Try some for practice!

Note: If you wish to remove any of the ellipses from the screen, use ERASE as described for copied library units.

2.3.3 LINE COLOUR

You can draw in any of six colours on the Draw Palette.

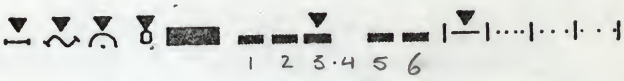


Fig 1

1 GREEN
2 MAGENTA ROOD
3 WHITE
4 BLACK
5 RED ORANJE
6 BLUE

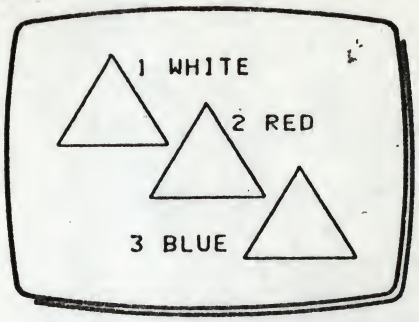


Fig 2

1 **Clear the screen using WIPE.**

2 **Draw a triangle with WHITE lines, (1) in Fig 2.**

3 **With the dynamic cursor select RED from the palette.**

4 **Draw a second triangle, (2) in Fig 2.**

5 **Return to the palette and with the dynamic cursor select BLUE.**

6 **Draw a third triangle, (3) in Fig 2 and then reselect WHITE.**

You will see that the 'rubber band' between cursors is always white, but the confirmed line takes the colour of the palette selection.

Caution!: Colour 4 is BLACK, and is invisible when used to draw with on a normal screen. It is useful for drawing on coloured backgrounds, (see PAINT). Drawing a black line over the top of an existing line can be used for screen effects, but is NOT the same as ERASE.

2.3.4 LINE TYPE

In addition to colour selections, there is also a choice of four line types on the palette.

Fig 1

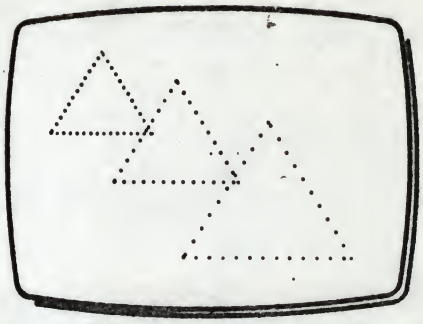


Fig 2

1 Clear the screen using WIPE.

2 Select any of the three types of broken line from the right of the palette see Fig 1.

3 Draw triangles, rectangles and circles to see the effect (see Fig 2).

4 Select continous line again, to continue normal drawing.

You can select a different line type any time in the drawing process.

2.3.5 PAINT

You also have a rapid paint facility you can use to fill any enclosed area on the screen with colour. Before you use PAINT, you will need to draw some shapes on the screen.

Fig 1

1 wit
2
3
4 AQUA
5 paars.
6 d. blauw
7
8 lichtgroen (geel?)
9 groen
10
11 oranje
12 ROOD
13
14 paars
15
16 zwART

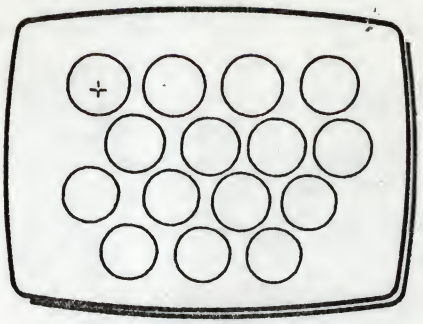


Fig 2

1 Clear the screen using WIPE and select circle cursor from the palette.

2 Draw a number of circles, keeping them separate, as shown in Fig 2.

3 Select PAINT from Menu, using the centre of the circle cursor to make the selection. The palette will change to give you the choice of 16 colours, and the cursor to a dynamic cursor, see Fig 1.

4 Select a colour from the palette (any except BLACK on the far right).

5 Move XY to position the dynamic cursor inside one of the circles.

6 Press and release T to paint the circle with colour.

7 Select another colour.

8 Paint a second circle.

9 Repeat until all the circles are painted, but don't clear the screen! It is used in the next exercise (ANIMATION 2.3.6)

Try experimenting with PAINT outside these tutorials to discover all its possibilities. Be creative! You can always ERASE or WIPE if the screen gets into a mess.

THINGS TO WATCH FOR WHEN PAINTING

* If there is gap in the boundary of a shape, the colour will leak out and fill the screen.

* You can remove a colour entry with ERASE, but the colour will remain on the screen until you clean up the drawing with PAGE.

* Once an area is filled with one colour, you cannot overpaint it with another until you erase the first. The exception to the above is black. Black overpainting causes colour in the selected area, and anything touching it, to disappear. However, you can remove black with ERASE to restore the original colour.

* Painted areas cannot be reproduced using a drafting plotter.

* Painted areas will be reproduced when your drawing is printed using a dot matrix type printer. Coloured areas will appear as patterns or tones if the printer is monochrome only.

2.3.6 ANIMATION

In Sect 2.3.5 we tried PAINT. Now you can try overpainting the drawings left from that exercise with black, to achieve an unusual effect.

1 **Select BLACK from the far right of the palette.**

2 **Move XY to position the dynamic cursor within one of the painted circles.**

3 **Press and release T to paint the circle black.**

4 **Repeat until all the circles have disappeared.**

You now have a blank screen, but ... your entire drawing since the last WIPE is still in the screen memory, even though you can't see it! This is because you have black circles on a black background.

Now store this apparently blank page, this time you'll need to label the index box so you can distinguish it from all the other empty boxes!

1 **Select FILE from the Menu.**

2 **Move XY to position the cursor frame over the chosen empty index box.**

3 **Press and release T to file the drawing in the box (more correctly, this is a drawing sequence rather than a drawing).**

4 **Using the computer keyboard, type in the label 'MOVIE' then press the RETURN key.**

5 **When the Work Page re-appears, select PAGE and watch the results.**

6 **Clear the memory using WIPE.**

Amazing! The entire drawing, including the black overpaint, has been re-played in the original sequence. This gives you some idea of the system's potential for instant animation.

2.3.7 FIND - Locating a point

One of the most difficult jobs to do well in drawing, even with pencil on paper, is ensuring that lines which are supposed to meet at a point, actually do so. With this system this is not a problem, there is an automatic FIND function you can use to locate the start of new lines on any previously drawn point.

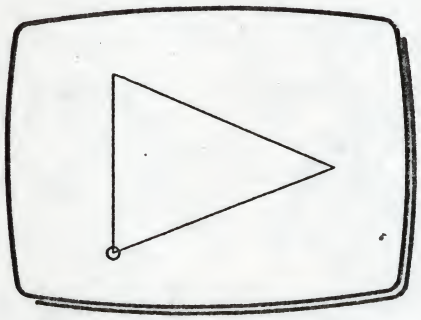


Fig 1

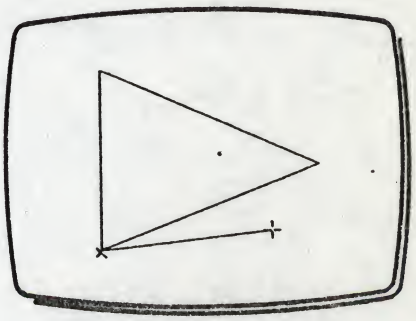


Fig 2

1 Clear the screen using WIPE.

2 Draw a triangle on the screen.

3 Select FIND from the Menu. A small diamond then marks the end of the line last entered, as in Fig 1.

4 Press and release L to step back through the drawing sequence. Note, there are two end points at each intersection, so the cursor may not appear to move.

5 Press and release R to step forward through the drawing sequence.

6 Press and release L or R to select one of the three points of the triangle, then press and release T to plant the origin cursor at the marked point.

7 Move XY back in to the Work Page, and you are now back in DRAW with the origin cursor at the new position. You can now continue the drawing precisely from the chosen point, as in Fig 2.

Note: With circles and arcs, the FIND function locates centres and end-points in sequence.

Press and release T at any time to exit FIND.

2.4 TUTORIAL 4

Tutorial 4 introduces the following topics.

Arcs

Arcs and Lines

2.4.1 ARCS

As well as drawing straight lines and circles, there is a further line drawing mode, arcs, which you can select from the palette. The ARC mode is denoted by the symbol shown at (1) in Fig 1 below. It is used for drawing an arc of a circle given a start direction and an end-point. The start direction is usually defined by the last line drawn on the screen, but you can change this if you wish.

Fig 1

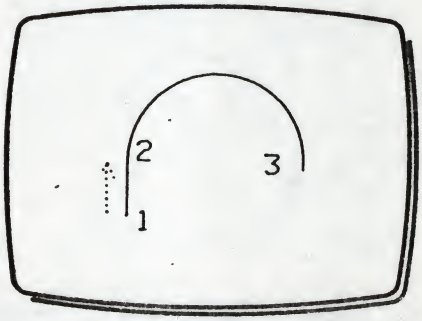


Fig 2

1 Clear the screen using WIPE.

2 Draw a straight line from (1) to (2) in Fig 2, this defines the arc direction.

3 Select the arc symbol (1) in Fig 1.

4 Move XY to position the dynamic cursor at (3) in Fig 2. This is the arc end-point.

5 **Press and release T to draw the arc.**

6 **Select LINE fron the palette to exit from ARC.**

Note: Palette selection escape. If you are having difficulty changing a palette selection, move XY to bottom left corner of the Work Page and press and release R.

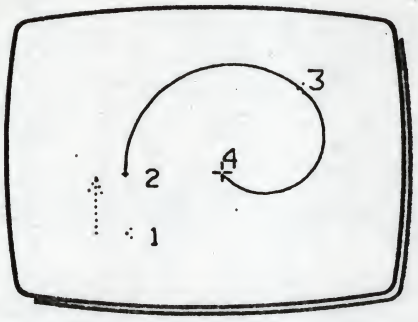


Fig 3

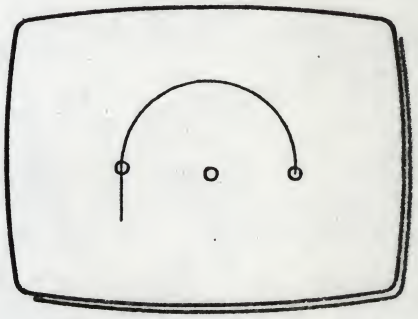


Fig 4

Now try starting an arc in space, without a line reference.

1 Clear the screen using WIPE.

2 Select the arc symbol from the palette.

3 Move XY to position the dynamic cursor at (1) in Fig 3.

4 Press and release L to position the origin cursor at this point.

5 Move XY to position the dynamic cursor at (2) in Fig 3.

6 Press and release L to position the origin cursor. You have now defined the arc direction.

7 Move XY to position the dynamic cursor at (3) in Fig 3. This defines the arc end-point.

8 Press and release T to draw the arc.

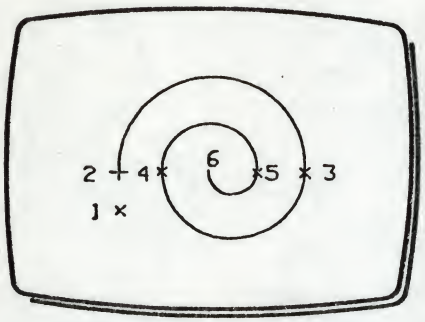
9 Move XY to position the dynamic cursor at (4) in Fig 3. Note that the second arc is a smooth continuation of the first.

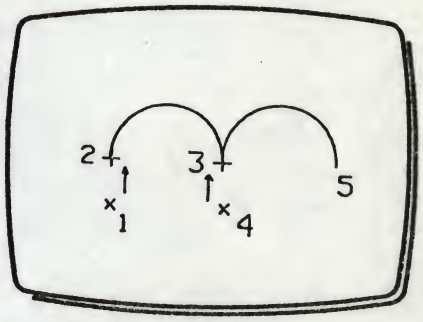
10 Press and release T to complete the second arc.

11 Clear the screen using WIPE.

Note: ERASE works with arcs as it does with lines, but in this case three points are marked by the small diamonds to indicate the entry, at the centre and two end points, see Fig 4.

Now try a few variations with ARC. With practice you will soon be drawing any arc you wish by judging the combination of start direction and end points. Try the examples below yourself.





FOR YOUR INFORMATION

The straight arc - a special case

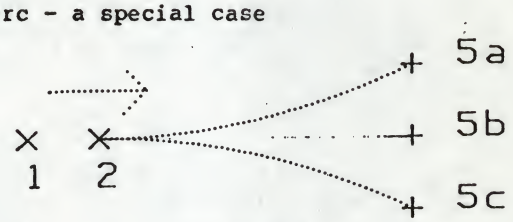


Fig 5

If you position the end-point exactly in line with the start direction, as 5b, you will draw a straight line. Any other end-points, as 5a or 5c, give curves as you would expect.

2.4.2 ARCS AND LINES

You can mix arcs and lines together to draw almost any shape you like. Practice by reproducing the shape shown here in Figs 1-4, but do not worry at this stage if your results do not look quite the same. Read through the exercise before trying it.

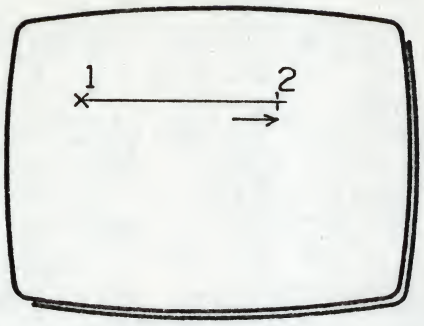


Fig 1

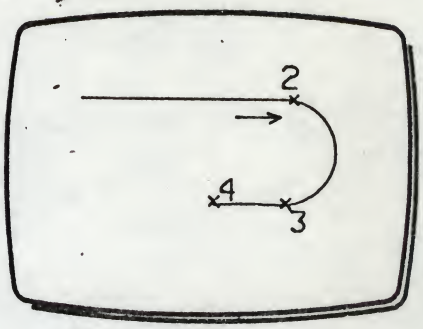


Fig 2

1 Clear the screen using WIPE (this also selects the straight lines drawing mode from the palette, bottom left corner).

2 Start the figure by move XY to position the dynamic cursor at (1) in Fig 1.

3 Press and release L to position the origin cursor at the same point.

4 Move XY to position the dynamic cursor at (2) in Fig 1.

5 Press and release T to draw the line.

6 Select the ARC symbol from the palette.

7 Move XY to move the dynamic cursor to (3) in Fig 2. Try to make an exact semi-circle.

8 Press and release T to draw the arc.

9 Select straight lines from the palette.

10 Move XY to move the dynamic cursor in a straight line from (3) to (4) in Fig 2.

11 Press and release T to draw the line.

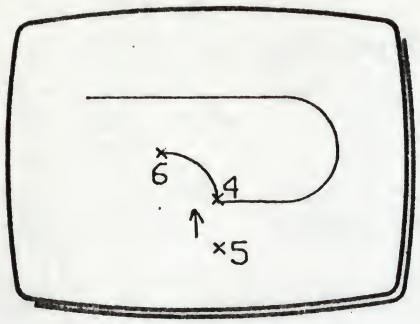


Fig 3

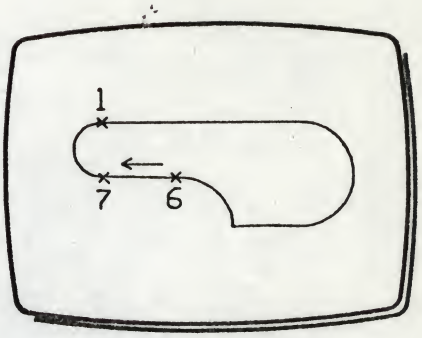


Fig 4

12 Select the ARC symbol from the palette.

13 Move XY to position the dynamic cursor at (5) in Fig 3.

14 Press and release L to re-position the origin cursor.

15 Move XY to return the origin cursor to (4) in Fig 3.

16 Press and release L to re-position the origin cursor. You have now directed the arc inward.

17 Move XY to move the dynamic cursor to (6) in Fig 3.

18 Press and release T to draw the arc.

19 Select straight lines from the palette.

20 Move XY to move the dynamic cursor to (7) in Fig 4.

21 Press and release T draw the line.

22 Select the ARC symbol from the palette.

23 Move XY to move the dynamic cursor to (1) in Fig 4.

24 Press and release T to draw the arc, and so complete the shape.

2.5 TUTORIAL 5

This Tutorial gives exercises on the following topics.

Nib Drawing - a special kind of 'area' drawing

Angled Nib - using Nib in different orientations

Nib with Spacing - using Nib to get different drawing effects

Tracing drawings using the Controller

Adding Text to your drawings using two different methods

2.5.1 NIB DRAWING

An unusual, but very useful function of the system is NIB drawing. This allows you to draw with a variable width stroke and to fill in blocks of tone or colour, in a single action with the Controller.

Fig 1

NIB SELECTION

To select the NIB mode move the dynamic cursor straight down to the '0' on the palette, see (1) in Fig 1. A white triangle will appear to indicate selection, move the stick vertically up to avoid changing the selection.

The cursor will change to a bright dot joined by broken lines to the start point (where the origin cursor was before you selected NIB). The width of the NIB can be altered by rotating Z.

You will see that one end of the NIB is marked with a small diamond. This is the 'active end', used like the dynamic cursor to make palette and menu selections.

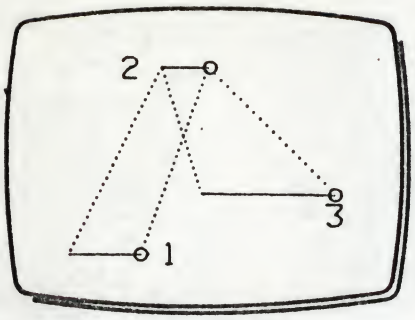


Fig 2

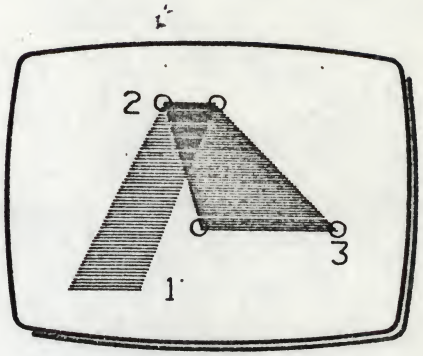


Fig 3

1 Clear the screen using WIPE.

2 Select the NIB from the palette (see Fig 1).

3 Rotate Z to alter the width of the NIB, and move XY to position the NIB at (1) in Fig 2.

4 Press and release L to fix this as the new start position.

5 Rotate Z and move XY to position the NIB at (2) in Fig 2, the broken lines will show the area which will fill in when you draw.

6 Press and release T to draw the nib stroke.

7 Rotate Z and move XY to position the NIB at (3) in Fig 2.

8 Press and release T to draw another nib stroke. The screen should resemble Fig 3.

9 Exit from NIB by selecting LINE from the palette.

Note: ERASE works with NIB as it does with lines, with one difference, all four corners of the nib stroke are marked.

2.5.2 ANGLED NIB

You can change the angle of the NIB as well as its width.

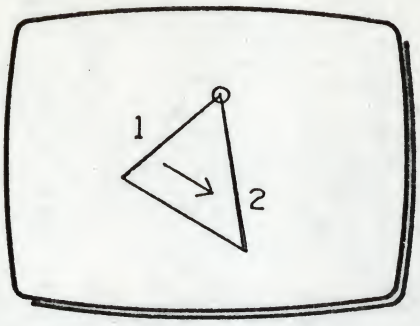


Fig 1

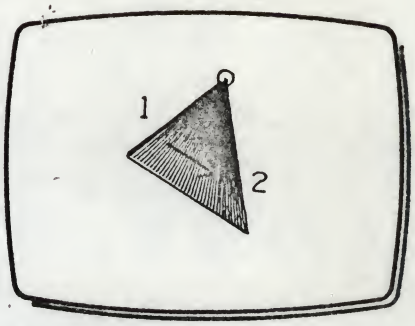


Fig 2

1 Clear the screen using WIPE.

2 Draw a medium size triangle, if the triangle is too large the NIB will not fit (see Fig 1).

3 Select NIB from the palette.

4 Press and hold R and rotate Z to alter the nib angle to match side (1) in Fig 1.

5 Release R to fix the nib angle (don't worry if the nib is too long).

6 Rotate Z to enlarge the nib to the length of side (1) in Fig 1.

7 Move XY to position the nib over side (1) in Fig 1, adjusting the nib length to fit it. Note that the small diamond should be at the top of the triangle.

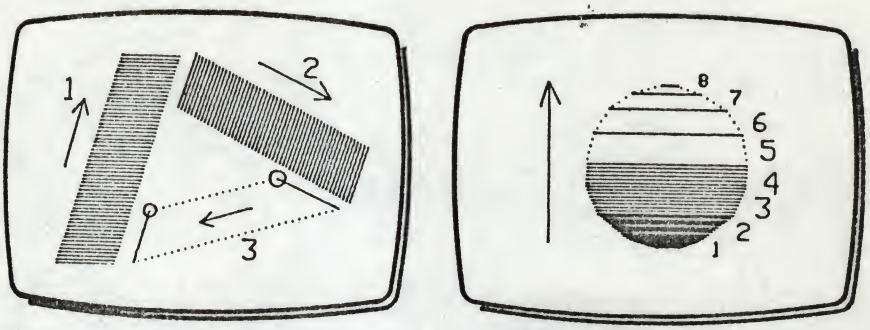
8 Press and release L to fix this as the start nib position.

9 Press and hold R and rotate Z to alter the nib angle to match side (2) in Fig 1.

10 Release R to fix the angle, then rotate Z to adjust the nib width to fit side (2) in Fig 1. The small diamond should be at the top of the triangle.

11 Press and release T to draw the nib stroke, and so fill the triangle.

With practice, you will be able it fill most shapes with one or more nib strokes. Experiment with the examples shown here.



2.5.3 NIB WITH SPACES

So far we have used only a solid nib to fill areas. Now you can open out the nib stroke to produce a range of hatching or tone effects. There are six different nib spacings numbered from 0 (solid) through 5 (widely spaced). See Fig 1.

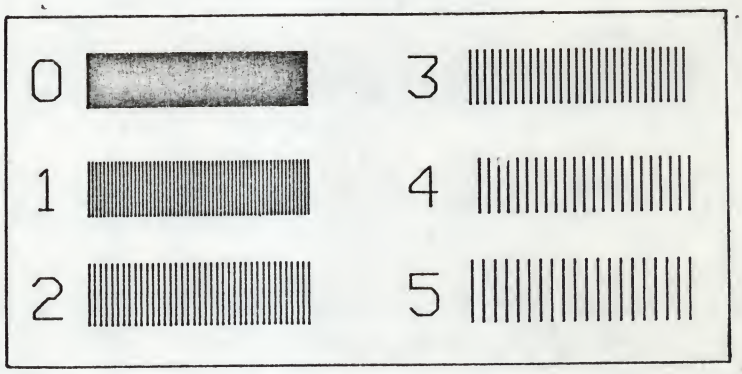


Fig 1

1 Clear the screen using WIPE.

2 Move XY to move the cursor straight down to to the '0' on the palette, and hold it there.

3 Press and hold L and rotate Z to change the number to '2'.

4 Release L and move the stick vertically up, leaving a white triangle over the number. You may have to practice this a few times to become proficient.

5 To change the nib stroke, move XY to the white triangle, press and hold L, then rotate Z to change the number up or down.

Notice the the block to the right of the number indicates the spacing you have chosen for the nib stroke.

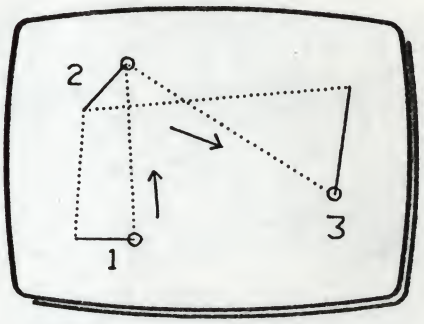


Fig 2

1 Clear the screen using WIPE.

2 Move XY to select NIB stroke, and set a Nib spacing.

3 Rotate Z and move XY to position the nib at (1) in Fig 2.

4 Press and release L to fix the start position.

5 Rotate Z and move XY to position the nib (2) in Fig 2.

6 Press and hold R and rotate Z to fix nib angle.

7 Press and release T to draw a nib stroke.

8 Press and hold R and rotate Z to position the nib at (3) in Fig 2. Rotate the nib 180 degrees to achieve the 'twisted ribbon' effect shown.

9 Press and release T to draw the nib stroke.

Here's an unusual nib effect

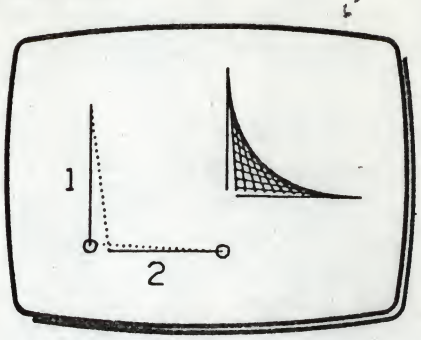


Fig 3

1 Clear the screen using WIPE.

2 Select NIB and set spacing to '3'.

3 Press and hold R and rotate Z to position the nib at (1) in Fig 3. Notice that the small diamond is at the bottom.

4 Press and release L to fix the start position.

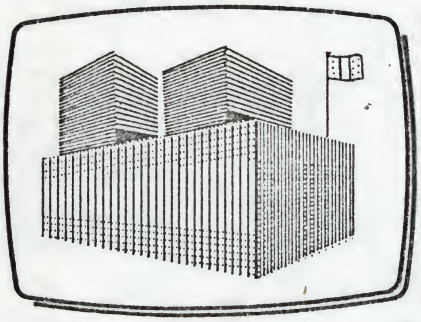
5 Press and hold R and rotate Z to position the nib at (2) in Fig 3. The small diamond is now at the right.

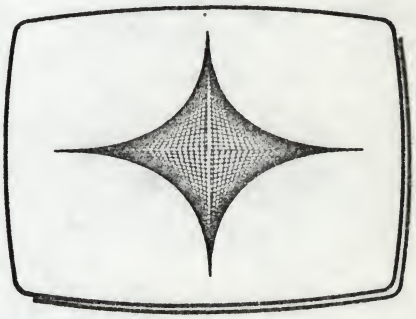
6 Press and release T to produce an instant 'string picture'.

Other textures can be developed using nib spacings as above in combination with different line types selected from the palette.

You can use NIB to create all kinds of amazing effects! Try changing colours from the palette while you fill the screen with nib strokes of various spacings, angles and sizes. Then you can replay the whole thing in sequence by selecting PAGE. You can FILE the sequence in a library index box if you wish.

Try the examples below.

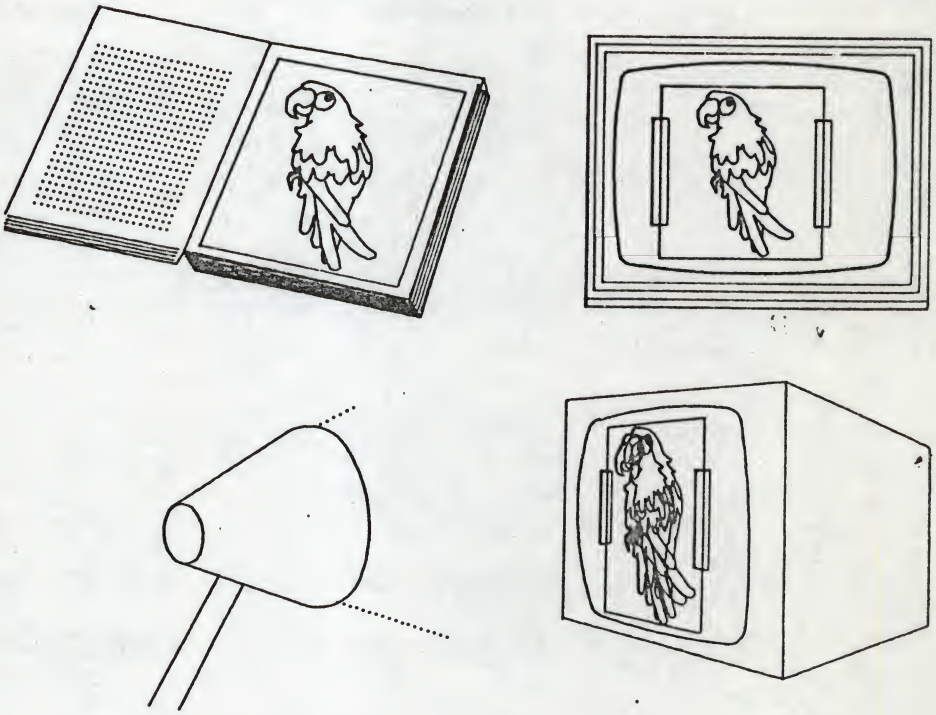




2.5.4 TRACE

You can trace existing artwork such as maps, logos, cartoons, and photographs. You use a screen overlay made by intermediate tracing onto transparent film (a method which costs you hardly anything at all). Obtain a transparency such as you would use for overhead projection. See Figs 1 - 3.

Note: If you have a Digitiser (Graphics Tablet) installed, this tutorial exercise can be skipped. Instead of this technique, you will use the Digitiser for any tracing work. Refer to Section 3.13 which covers the use of Digitisers and Tablets.



Figs 1 - 3

1 Using a strong black line, trace (or otherwise create) the desired outline on to the film, making sure it fits within the active area of the screen.

2 Tape the film onto the screen.

3 **Position a light source behind you, pointed at the screen. You will see a shadow of the drawn outline on the surface of the screen.**

4 **Trace the outline using the regular drawing cursors, pressing and releasing T as you go. In this way the outline is entered as a series of short lines or arcs.**

5 **You can FILE the drawing at any stage of completion.**

Complete a brief tracing and FILE it before going on to the next exercise.

2.5.5 FREEHAND DRAWING

The tracing technique described above is not the same as TRACE shown on Menu 1. When you select TRACE you can draw freehand on the screen using the 'stream' feature. The cursor changes to a dot under XY control. As this method of drawing uses a lot of computer memory to store data, the system will warn you by beeping every time the Memory Counter reduces by 1000.

1 **Clear the screen using WIPE and then select TRACE. The cursor changes to a dot which can be moved XY to a start point.**

2 **Select a point to start drawing and press and hold T.**

3 **Move XY to draw a shape. When you release T, note the effect on the Screen Counter.**

4 **Exit TRACE by reselecting DRAW.**

Caution!: Freehand drawing consumes large amounts of memory and because of this the system gives an audible signal as a warning.

Once it beeps, the system is no longer accepting drawing input. To continue drawing release T; then use PAGE to redraw what has been stored and reselect TRACE.

2.5.6 TEXT

The system handles text in a unique and powerful way. From the computer keyboard you can type dimensions, labels and notes for your drawings, or you can compose whole paragraphs and formatted blocks of text for page layouts, reports and forms. See Fig 1.

Text can be added to a drawing by either of two methods, (1) direct entry from the keyboard, or (2) copied from a library index box.

TEXT - DIRECT ENTRY

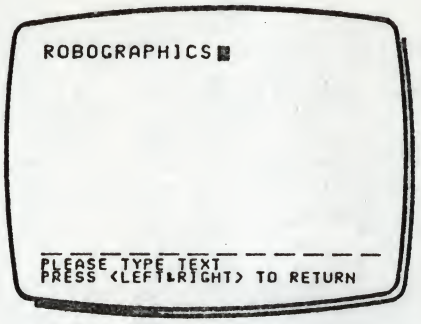


Fig 1

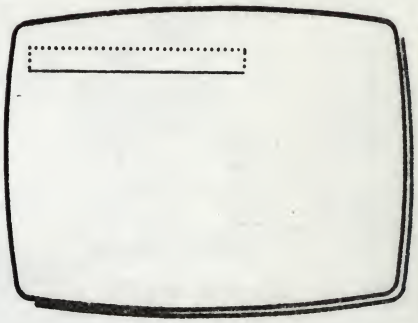


Fig 2

1 Clear the screen using WIPE.

2 Select TEXT from the Menu. The palette is replaced with a screen for text entry, see Fig 1.

3 Type a name using upper and lower case letters. Upper case is the default condition. For both Apple II and Apple IIe, press ESCAPE key to obtain lower case. Press ESCAPE again to revert to upper case.
You may use CTRL key together with W, Z, A or S keys to move through the text block if editing is required. On the Apple IIe, the 'arrow' keys may also be used for this purpose.

4 Press and release L and R together to revert to the Work Page. The cursor changes to a box cursor.

5 Move XY to locate the box cursor on the Work Page. The cursor defines the exact area the text will occupy at standard size.

6 Rotate Z to alter the size of the box. To ensure consistency of type sizes on a single drawing, only five choices are available, for this example choose two times standard size.

7 Position the box cursor as shown in Fig 2, making sure that none of the box is cutoff (i.e. outside the active area).

8 Press and release T to draw the text.

9 Do not clear the screen, as you will be adding to it in the next exercise.

Note: You can use other colours, but you must first select the colour from the palette before selecting TEXT.

To exit TEXT any time press and release L and R together.

ERASE works with TEXT as it does with NIB.

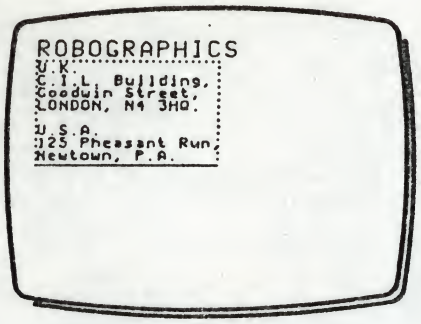


Fig 3

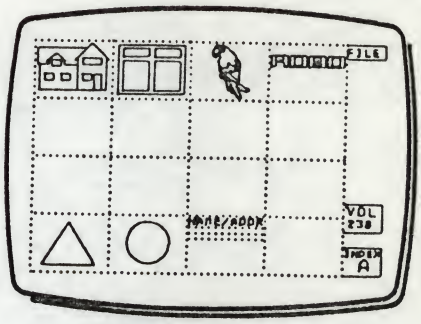


Fig 4

1 Select TEXT again.

2 Type in your address; this time press RETURN on the keyboard at the end of each line.

3 Press and release L and R together to revert to the Work page.

4 Move XY to position the cursor under your name. This time leave the box at standard size.

5 Press and release T to draw your address, as in Fig 3.

6 Select FILE from the menu, then place your name and address in an empty library box, as in Fig 4.

When filed, the text will appear in the index box as broken lines, because it is too small to display. For this reason, you would wish to label it (e.g. NAME/ADDR). The reason for this effect is explained below.

DISPLAY OF SMALL SCALE TEXT

Text entered at half and quarter-standard sizes will be displayed as dotted lines. However, the text is there even if you cannot read it. You can make it reappear on the screen by enlarging the area using the ZOOM function; which is covered later on.

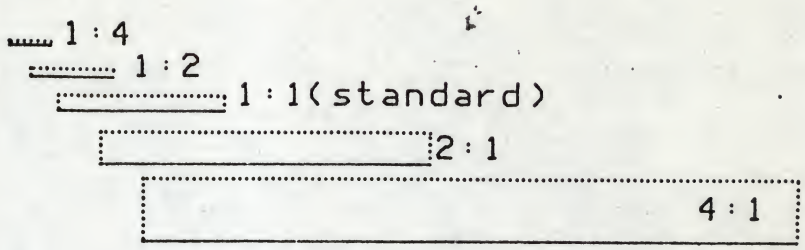


Fig 5 - The text cursor sizes (regular orientation)

As well altering the size of text, you can also place it in any of four orientations.

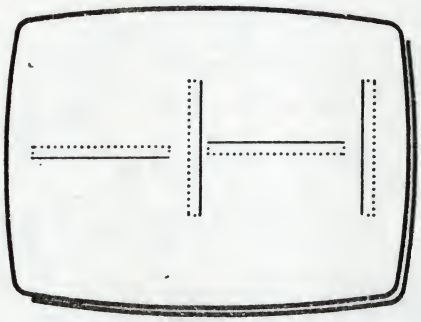


Fig 6

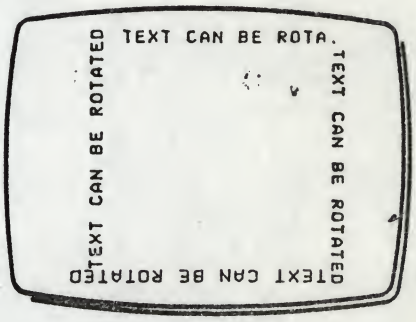


Fig 7

1 Clear the screen using WIPE.

2 Select TEXT.

3 Type in something, e.g. 'TEXT CAN BE ROTATED'.

4 Press and release L and R together to revert to the Work page.

5 Press and hold L and rotate Z to rotate the box cursor. The solid line defines the bottom of the text. See Fig 6 for the different rotations possible.

6 Press and release T to draw the text in the chosen orientation, as in Fig 7.

Repeat the above instructions to enter text at different orientations.

2.5.7 TEXT - COPYING FROM LIBRARY

Copying from the library gives greater flexibility

Direct entry text, is purposely limited in choice of size and orientation. However, with this method you can draw text at any size, rotatation and proportion by filing it in the library, then copying it to the Work page. This method of text generation gives you unlimited choice of type style and size. The copying technique is also useful when you need to repeat a particular label or paragraph.

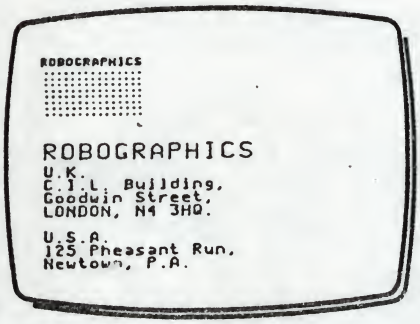


Fig 1

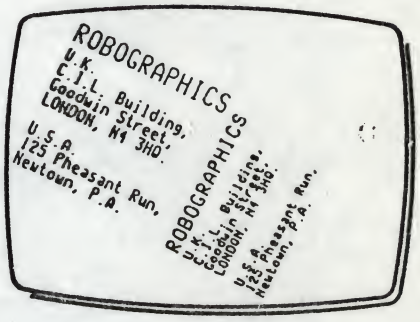


Fig 2

1 Clear the screen using WIPE.

2 Select COPY from the Menu.

3 Position the cursor frame at the index location containing your name and address.

4 Press and release T to select it.

5 When the work page re-appears, you can position and alter the cursor frame in the normal way for any COPY unit, as you have previously learned, using SCL, ROT and STR.

6 Plant the text at different sizes, rotation and proportions to see various effects (see Figs 1 and 2).

Note: ERASE any of the planted text blocks as you would any other copied library units.

Once text has been filed, you cannot edit it. You can however, re-type the text, then 'over-file' it in the previous library location, this will automatically substitute new text for old wherever it may have been used on the same library disk - a very powerful facility.

At this stage we are working freeform to get some idea of the potential of copied text. This technique, using predrawn library units, can be used to produce neat, consistent text layout in a variety of sizes and modified fonts.

MIRROR IMAGE AND COLOURED TEXT

For mirror image text use FLIP
For coloured text use the colour override facility

These features are covered in the next tutorial.

2.6 TUTORIAL 6

Tutorial six covers several features of the system which allow you immense flexibility in the way you approach a drawing task. The following features are introduced.

- Zoom - expanding detail in your drawing
- Zoom and Pan
- Zoom with Library units
- Reversing Zoom
- Mirror images
- Changing Line Colour
- Changing Line Type

2.6.1 ZOOM

You have already seen that the system provides a very flexible repertoire of graphics facilities. However, you will also have noticed that the definition, or resolution of detail on the screen is somewhat limited. This is a feature of the computer's display system, but it does not limit the quality of drawings you can produce with the system. The reason for this, is a powerful magnifying (ZOOM) facility which enables you to add as much detail as you could possibly need!

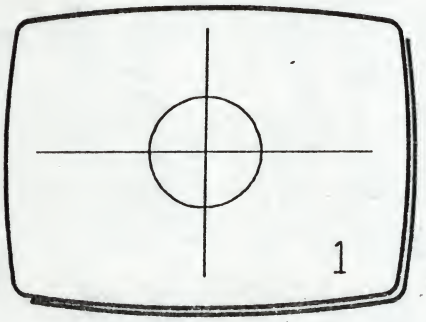


Fig 1

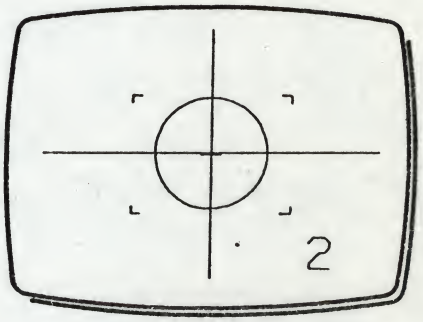


Fig 2

1 Clear the screen using WIPE.

2 Draw a figure similiar to (1) in Fig 1.

3 Select ZOOM from the Menu.

4 Move XY and rotate Z to position the frame cursor over the circle, (2) in Fig 2, enclosing the circle closely.

5 Press and release T to enlarge the area. The page will clear, and the area defined by the frame cursor will be re-drawn, filling the screen.

You can now add more detail to the drawing, then re-display it at the original base page scale, as shown in the remainder of the exercise.

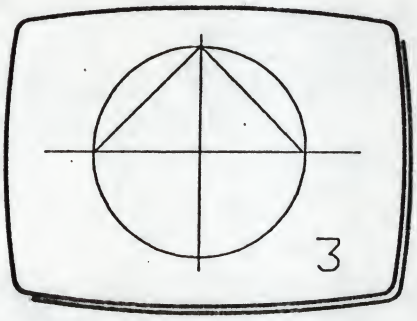


Fig 3

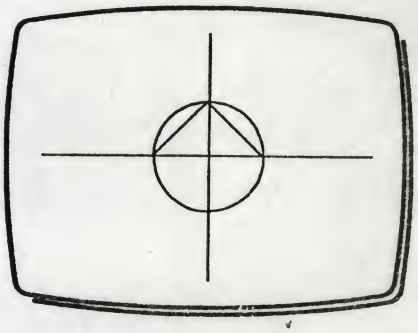


Fig 4

1 Exit ZOOM by pressing and releasing L and R together (this returns the system to DRAW, with the palette function you had selected before ZOOM).

2 Draw two lines as (3) in Fig 3. Note that it is easier to add the detail at this scale.

3 Select PAGE from the Menu. The drawing will re-appear at base page scale, and will include the added detail (Fig 4).

4 Do not clear the screen, it is used in the next exercise.

2.6.2 ZOOM and PAN

You can repeat ZOOM as often as you like, until you reach the required magnification, and then use a related function, PAN, to view off-screen areas of the drawing at that magnification (in effect PAN moves the 'screen window' around the drawing.

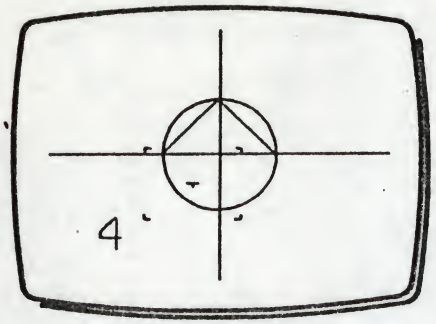


Fig 5

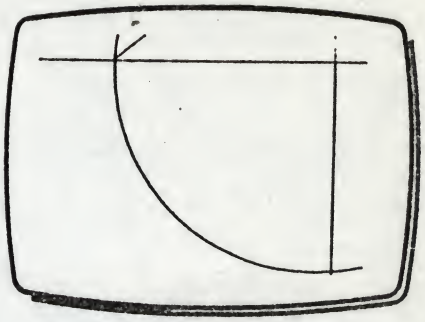


Fig 6

1 Select ZOOM from the Menu.

2 Move XY and rotate Z to frame a quarter of the circle with the cursor, as (4) in Fig 5.

3 Press and release T, and the framed area will appear full-screen, (5) in Fig 6.

4 Using the centre of the frame cursor, select PAN from the Menu. The cursor now on the screen is fixed at full screen size.

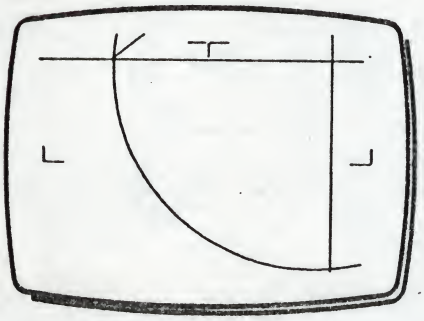


Fig 7

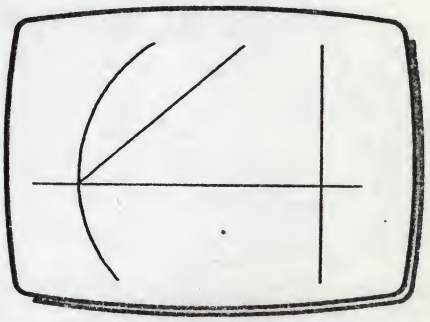


Fig 8

5 **Move XY to move the centre of the cursor to the top centre of the screen, (6) in Fig 7.**

6 **Press and release T to view the portion of the drawing enclosed by the PAN cursor, (Fig 8).**

7 **Press and release L and R together to exit PAN and ZOOM.**

FAST PAN

If your drawing contains a lot of detail (more than the simple example above), you can save time when panning repeatedly by suppressing the display. Just hit the keyboard space bar after each press and release of T. It can be used if you want to PAN several Work Page widths, unwanted intermediate views can be suppressed as soon as they are identified and a further PAN started.

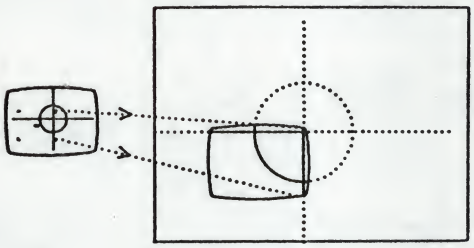


Fig 1

Effective base page after ZOOM.

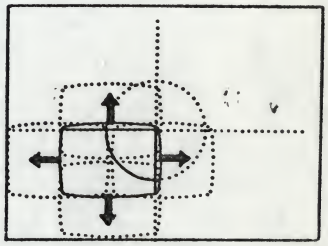


Fig 2

Fig 2 - PAN shifts the 'magnifying lens' around the base page, in increments of up to one-half the screen width (or height, depending on direction).

As shown here, you can PAN repeatedly to view any part of the base page.

Note: If you try to PAN or ZOOM outside the Work Page boundary the system will beep and ignore the command.

2.6.3 ZOOM WITH LIBRARY UNITS

As well as using ZOOM to draw added detail, you can also plant whole library units at different magnifications. For practice use Index A of the Introductory Library Disk. This exercise has a large number of steps so read it through before you begin.

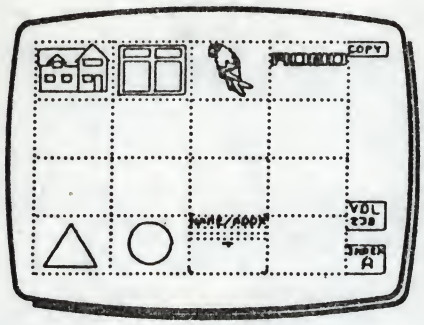


Fig 1

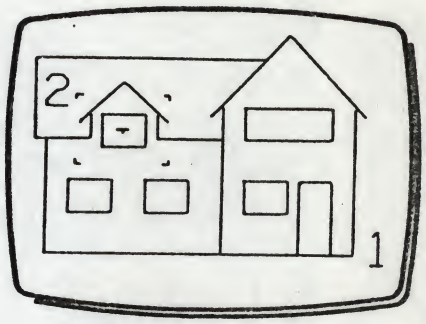


Fig 2

1 Clear the screen using WIPE.

2 Select COPY from the Menu, the Library Index page will appear (Fig 1).

3 Move the cursor to position the cursor frame over the house at top left.

4 Press and release T to return to the Work Page with the unit.

5 Move the dynamic cursor and rotate Z to adjust the cursor frame as in Fig 2.

6 Press and release T to plant the unit at (1) in Fig 2.

7 Select ZOOM from the Menu using the centre of the Copy Cursor.

8 Move XY and rotate Z to position the cursor over the window as (2) in Fig 2.

9 Press and release T to draw an enlarged view of the window as in Fig 3.

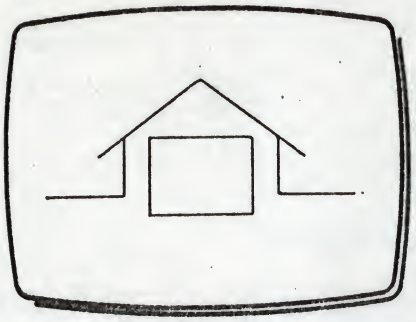


Fig 3

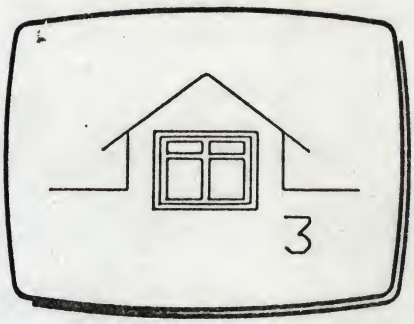


Fig 4

10 Select COPY from the Menu using the centre of the ZOOM cursor.

11 Select the window frame from the library index.

12 Press and release T to return to the Work Page.

13 Move XY and rotate Z to fit the cursor exactly to the window aperture.

14 Press and release T to draw the window frame as (3) in Fig 4.

15 Select ZOOM again.

16 Press and release T to draw an enlarged lower section of the window frame as in Fig 5.

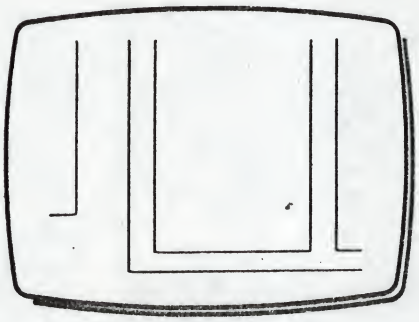


Fig 5

Fig 6

17 Select COPY.

18 Select the parrot shown in one of the library indexes.

19 Press and release T to return to the the Work Page.

20 Move XY and rotate Z to position the cursor as (4) in Fig 6.

21 Press and release T to draw the parrot.

22 Press and release L and R together to exit COPY.

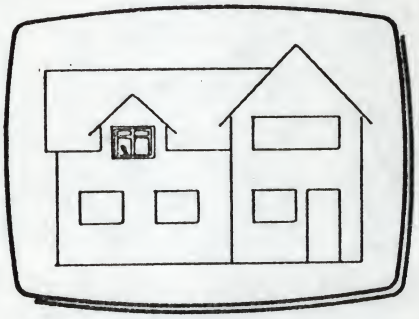


Fig 7

23 Select PAGE from the Menu. The complete drawing will appear at base page scale, as in Fig 7. You can now ZOOM on another part of the house, adding details as you wish.

24 Select FILE from the Menu. Then save the drawing in an empty box.

Note: This illustrates how you can assemble and file highly complex drawings with a minimum of effort.

For interest, you might wish to re-examine the detail you just added.

1 Clear the screen using WIPE.

2 COPY the composite drawing back to the screen at any size and position.

3 ZOOM to take a closer look at the detail. You can make further additions if you wish, then re-save.

2.6.4 REVERSE ZOOM

When looking at a zoomed view, you will notice that there is a point of rotation in which the zoom cursor frame is turned inside-out. In that condition, press and release T causes the current Work Page zoomed view to collapse to the size and position defined by the inverted frame, thus 'de-zooming' to the extent specified (See Fig 1).

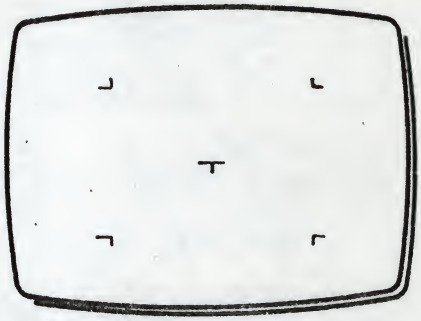


Fig 1

Note: If you attempt to 'de-zoom' off the boundary of the Work Page, the system will beep and ignore the command. Select PAGE to redraw the Work Page view.

2.6.5 COPY - MIRROR IMAGES

With the system you can FLIP any library unit copied from the library for instant mirror image effects.

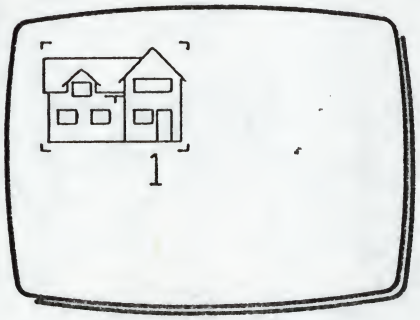


Fig 1

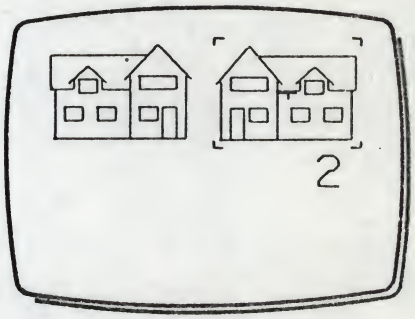


Fig 2

1 Clear the screen using WIPE.

2 Select COPY from the Menu.

3 Move XY to position the cursor frame over the house at the top left of Library Index A.

4 Press and release T to return to the Work Page.

5 Rotate Z to reduce the size of the cursor frame to 30% (notice the value of the number SCL on the palette).

6 Touch SCL with the centre of the frame to lock this setting.

7 Plant the house at (1) in Fig 1.

8 Touch the 'X' of 'X FLIP Y' on the palette with the centre of the cursor frame to activate 'flipping' in the X axis.

9 Plant the house as (2) in Fig 2. The house appears as a mirror image of (1) about the vertical axis.

10 Touch the 'X' of 'X FLIP Y' to de-activate.

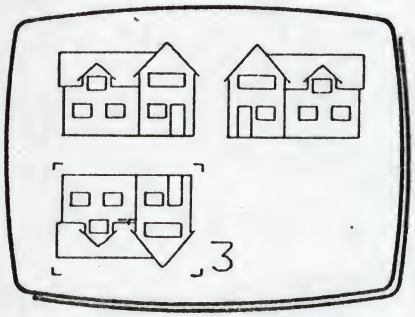


Fig 3

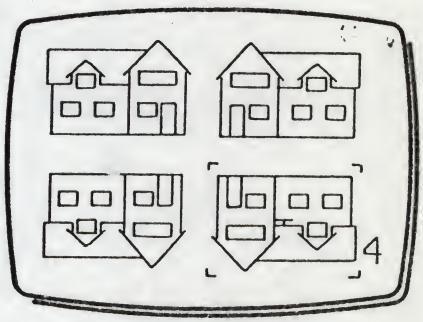


Fig 4

11 Touch the 'Y' with the centre of the cursor frame to activate the Y axis FLIP.

12 Plant the house as (3) in Fig 3. The house is now a mirror image of (1) about the horizontal axis.

13 Leaving 'Y' on, touch 'X' again.

14 Plant the house as (4) in Fig 4. The house is now mirrored about both vertical and horizontal axes.

Note: This last case is the same effect as can be achieved with a 180 degree rotation of the frame with no FLIP functions engaged.

2.6.6 CHANGING COLOUR OF LIBRARY UNITS

To the right of 'X FLIP Y' on the Copy Palette you will see a white flag. When engaged, this indicates the colour of the library unit when it is planted. The colour of the flag, and therefore the library unit, can be changed.

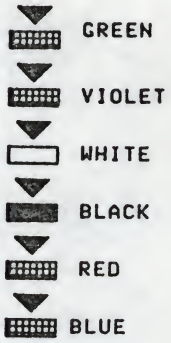


Fig 1

1. Clear the screen using WIPE.
2. Select COPY from the Menu.
3. Move XY to select your triangle from Index A.
4. Press and release T to return to the Work Page.
5. Move XY to locate the centre of the cursor frame on the colour flag on the palette, and hold it there.
6. Press and hold L and rotate Z to change the flag colour. Set it to red then release L.
7. Move XY to move the centre of the cursor frame up. A white triangle should appear over the flag (if not, touch the flag again with the frame centre).
8. Press and release T to plant a red triangle.
9. Do not clear the screen yet.

Try repeating this procedure for several triangles of different colours.

2.6.7 CHANGING LINE TYPE OF A LIBRARY UNIT

You can also change the line type used when the library unit is planted.

Fig 1

1 Touch the block to the right of the colour flag with the centre of the Copy Cursor frame, being careful not to set the other adjacent options.

2 Press and hold L and rotate Z to select a line type.

3 Plant the unit with different line types to see the effect.

PRACTICE WITH THE COPY PALETTE

Once you are used to the COPY palette, you will see that its powerful functions can save a great amount of time and effort, especially when assembling drawings from a number of similar modules.

2.7 TUTORIAL 7

This Tutorial introduces you to 'Editing' functions. These are functions which allow you to change or manipulate Library units within your drawings. The following topics are covered.

Moving library units about within drawings

Duplicating units

Exchanging units

Modifying a Library unit

Modifying a Work Page unit

Exchanging a Single Library unit

Global Exchange of a Library unit

2.7.1 MOVE

You have seen in COPY and ERASE how library units are dealt with as whole units for planting on, or erasing from your drawings. This aspect is also used by another feature of the system, the MOVE function. This allows you to move a unit from one part of your drawing to another very simply.

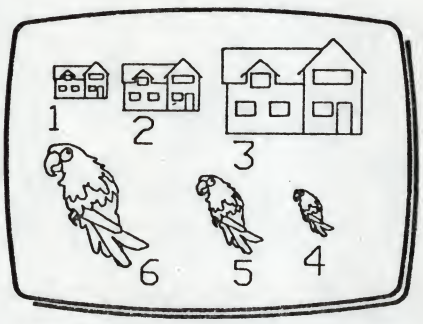


Fig 1

Fig 2

1 Clear the screen using WIPE.

2 Select COPY from the Menu and select any library unit from the library, placing it three times at separate locations on the screen, as (1) through (3) in Fig 1.

3 Re-select COPY and select a different library unit from the library.

4 Place the new unit three times, as (4) through (6) in Fig 1. This simulates an assembly of library units such as you might have in a 'real' project.

Now we will use MOVE to manipulate the planted units.

MOVING UNITS ABOUT

With MOVE, you can both re-position a library unit and change its character completely, colour it, rotate it, stretch it, and more, using all the facilities of the Copy Palette.

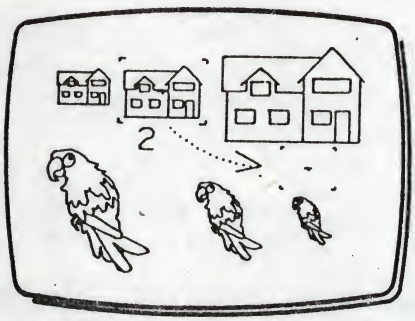


Fig 3

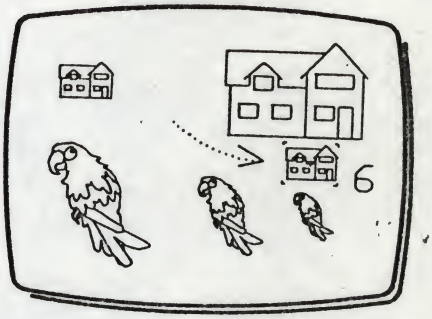


Fig 4

1 Select MOVE from the menu. Menu 2 and the Copy Palette are displayed. A flashing frame cursor marks the last planted library unit, (6) in Fig 2.

2 Press and release L to step back through the planting sequence.

3 Press and release R to step forward through the planting sequence.

4 Press and release T when you have marked a unit you wish to move, the frame stops flashing, and a second cursor frame appears carrying (invisibly!) the marked library unit, as in Fig 3.

5 Move XY to move the second cursor frame to the desired new position. With this frame you have all the usual COPY controls (scale, rotation, stretch).

6 Press and release T again, the original library unit is erased and re-drawn as defined by the movable cursor frame, as in Fig 4.

7 Press and release L and R together to exit MOVE then and select PAGE to redraw, but do not use WIPE.

Note: Until exit the MOVE function remains engaged, so you can move the same library unit again, using press and release L or R as before.

2.7.2 DUPLICATE

The DUPL facility allows any library unit copied onto the screen to be duplicated, no matter which library disk it came from. You can copy from a number of different library disks, taking one of each library unit you plan to use frequently in your drawing. The 'frequently used' library units can be planted at one side of the screen out of the way (in effect a temporary library), and the DUPL function can then be used to copy them as required.

A temporary library of symbols used like this can save you a lot of time, not to mention repetitive disk handling. Additionally, all functions of the COPY palette can be applied with DUPL.

Fig 1

Fig 2

1 Select DUPL from the Menu. Menu 2 and the Copy Palette are displayed. A flashing frame cursor marks the last planted library unit (Fig 1).

2 Press and release L (step back) or R (step forward) through the planting sequence to choose your unit.

3 **Press and release T. You now have a COPY cursor, with full functions, carrying a duplicate of the chosen library unit (Fig 2).**

4 **Press and release T to plant the duplicated library unit where required, as in Fig 3.**

5 **Press and release L and R to exit DUPL, but do not use WIPE.**

Fig 3

2.7.3 EXCHANGE

This facility allows you to exchange any library unit on the screen for another library unit from any library disk. The incoming library unit from the library assumes exactly the original unit's characteristics, i.e. it will have the same position, scale, rotation, etc. You cannot set fresh conditions for EXCH.

EXCH is particularly useful for substituting symbols in a diagram, furniture or machine outlines on a ground plan, and text paragraphs on a page layout.

In addition, exchanged units retain the same slot in the planting sequence (and therefore replay sequence) as the original - an essential feature when changing elements in an animated sequence.

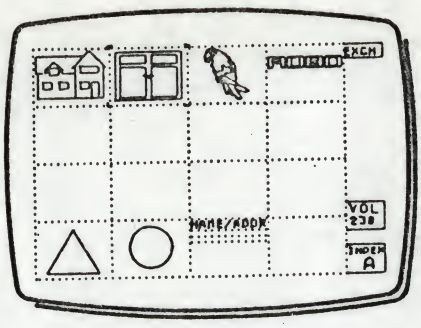


Fig 1

Fig 2

1 Select EXCH from the Menu, and the library index will appear (Fig 1).

2 Position the cursor frame at the location containing the desired replacement library unit.

3 Press and release T to confirm. The Work Page will re-appear with a flashing frame cursor marking the last library unit planted (Fig 2).

Fig 3

4 Step through the drawing using L and R to locate the unit to replace.

5 Press and release T. The marked unit will be erased and replaced by the library unit you chose from the library disk (Fig 3).

6 Press L and R to exit EXCH.

2.7.4 LOAD - MODIFYING A LIBRARY UNIT

You will have noticed that when your drawing contains a unit copied from the Library using COPY, the unit is treated as an complete entity and not a collection of individual entries. For example, ERASE will take out the complete unit, when you might only wish to remove one particular line.

The LOAD and EDIT functions on the Menu allow you to modify Library Units, as if they were normal Work Page drawings.

The next exercises illustrate the use of the two functions to modify and exchange Library Units.

MODIFYING A LIBRARY UNIT STORED IN THE LIBRARY

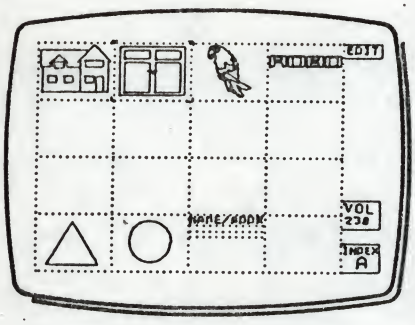


Fig 1

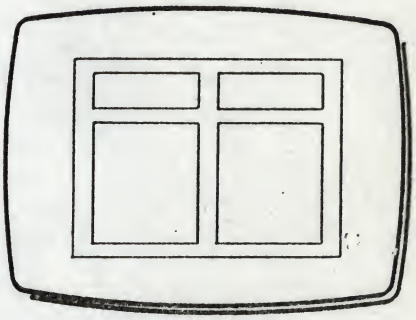


Fig 2

1 FILE the contents of the Work Page if you wish to save it. (the following procedure erases any material on the screen)

2 Select Menu 2 by moving XY to MENU then press and release L. Then move XY to select LOAD from Menu 2.

3 Press and release L to confirm the selection, and the library index will appear (a LOAD flag appears at top right).

4 Position the cursor frame at the location containing the desired library unit.

5 Press and release T. The Work Page returns, and the chosen library unit appears at its original drawn scale and, unlike normal copied units, can be freely amended.

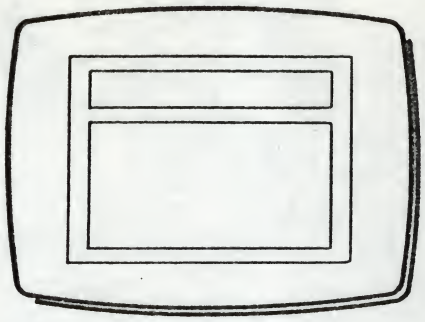


Fig 3

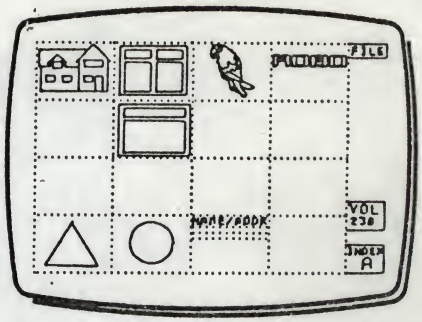


Fig 4

6 **Now try erasing part of the drawing and then add new detail, (Fig 3).**

7 **FILE the modified drawing in an empty library location (Fig 4).**

8 **When the Work Page returns, modify the drawing again and re-file this third version. You can repeat this process as many times as you wish.**

Note: All the normal drawing functions including ZOOM, ERASE, and FIND can be used. However, if the loaded Unit uses another Library Unit within it, that unit will be treated as a complete entity as normal. Detail within the embedded unit can be accessed using the EDIT function illustrated in the next exercise.

2.7.5 EDIT - MODIFYING A WORK PAGE UNIT

Library Units embedded in a drawing that require modification, can be modified without referring to the original Library Disk.

The EDIT function allows you to modify library units directly from the Work Page. Any unit on the Work Page can be selected, it is not necessary to have the original Library in the disk drive.

If the unit selected itself contains embedded units, and that embedded unit also needs modification the EDIT function can be used as many times as necessary to get back to the required detail.

As with LOAD, you should first FILE the Work Page if you want to preserve it, **before** selecting EDIT. This function WIPES the Work Page once the required unit has been selected.

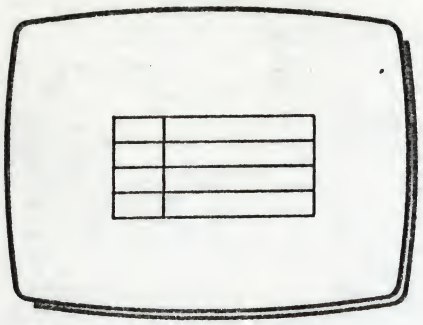


Fig 1

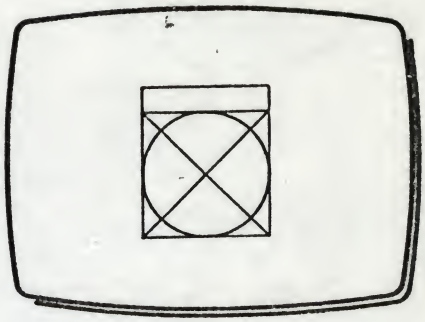


Fig 2

1 Draw, and then FILE the shape shown in Fig 1.

2 Clear the screen using WIPE.

3 Draw, and the FILE the shape shown in Fig 2.

4 Clear the screen using WIPE.

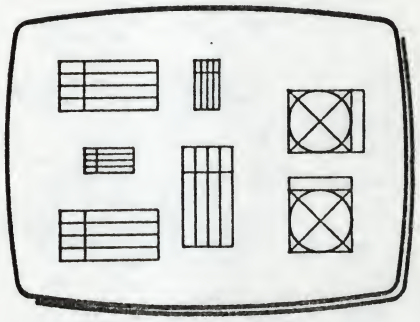


Fig 3

5 Copy both shapes on to the Work Page at various sizes and rotations (Fig 3).

6 FILE the composite drawing in an empty box on the Library Disk.

Now an example composite drawing has been created, continue with the exercise by modifying the units with EDIT.

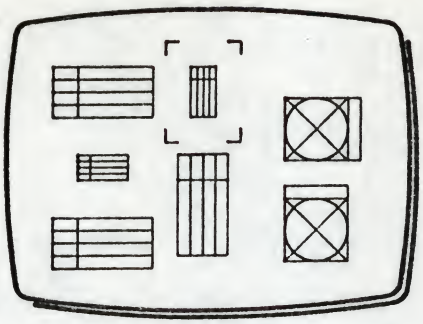


Fig 1

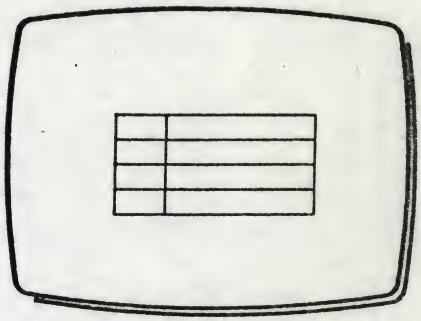


Fig 2

1 Select EDIT from the Menu 2, press and release L to confirm. The Work Page is displayed with the cursor frame around the last library unit planted.

2 Press and release L or R to select a unit for modification (Fig 1).

3 Press T to confirm the selected unit. The unit is displayed at its original size and rotation (Fig 2). All other Work Page entries have been erased, hence the need to FILE the original composite drawing.

4 Remove a few lines from the drawing (Fig 3).

5 FILE the modified library unit in an empty box in the Library.

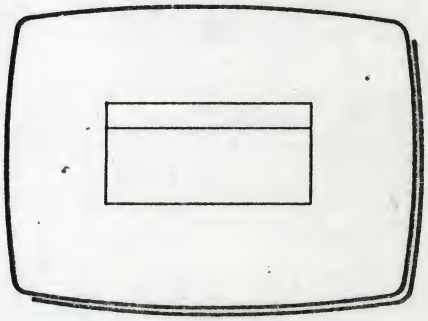


Fig 3

2.7.6 EXCHANGE SINGLE LIBRARY UNIT

Now you have learnt how to modify Library Units, both original Library Units, and units retrieved from the Work Page. If the original unit is included elsewhere, and must be replaced with the new modified unit, what do you do?

The LOAD and EDIT functions provide the means to replace one Library Unit with another. There are two types of replacement possible. Single unit exchange, where one unit is selected and exchanged. Global exchange, where every occurrence of a particular unit on a Library disk is exchanged automatically.

SINGLE UNIT EXCHANGE

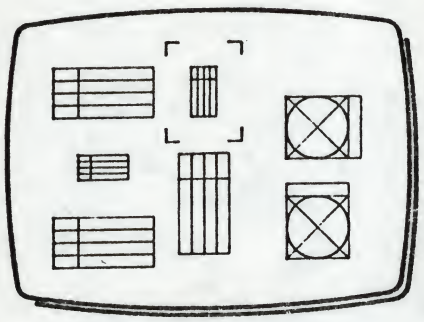


Fig 1

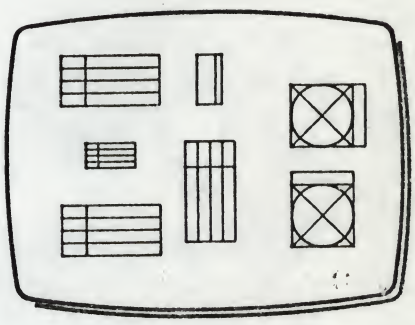


Fig 2

1 Select LOAD from Menu 2. Press and release L to confirm.

2 When the Library is displayed, select the composite drawing previously created, and press and release T.

3 After the drawing has been replayed, select EXCH from the Menu, and the Library Index is again displayed.

4 Move XY to the modified unit you filed in the previous exercise, then press and release T to place it in memory (it is not displayed at this time).

5 The composite drawing reappears, with a cursor frame around the last unit planted (Fig 1).

6 Frame the top centre shape, then press and release T to confirm. The shape is erased and replaced by the modified unit, appropriately scaled, as in Fig 2.

7 Press and release L and R to exit EXCH.

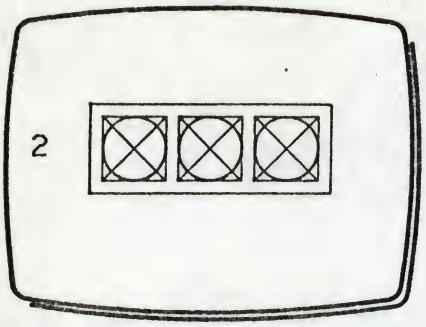


Fig 2

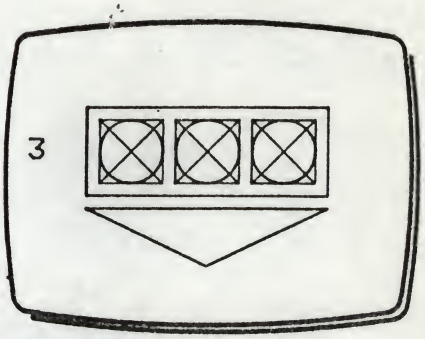


Fig 3

4 Clear the screen using WIPE.

5 COPY the drawing just filed.

6 Add some lines to it as in Fig 2.

7 FILE it in an empty library box.

8 Clear the screen using WIPE.

9 COPY the drawing just filed.

10 Add some more lines to it as in Fig 3.

11 FILE it it an empty library box.

You now have two stored Library Units based on a single component drawing. Now we will modify the that component drawing.

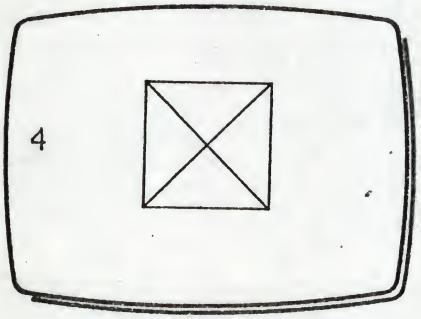


Fig 4

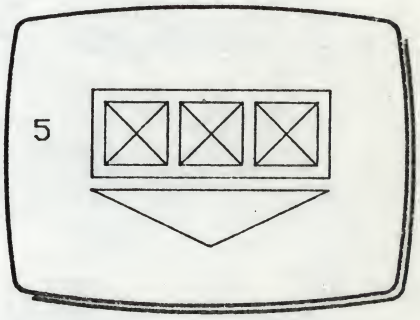


Fig 5

2.7.7 GLOBAL EXCHANGE OF LIBRARY UNITS

If you wish to exchange every occurrence of a Library Unit in a composite drawing, you can use the automatic editing procedure providing the Library Unit and composite drawing are on the same Library Disk.

To do this, you do not file the modified unit in an empty Library Index box, instead you replace the original unit by filing over the top of it with the modified version.

This is a powerful but dangerous feature!

When you pull a unit out of a Library, modify it and then put it back in the same place, you will find that every other drawing or Library Unit which contains the newly modified unit, has been automatically updated to reflect the change.

How does automatic editing work? The component drawing is stored only once on the Library Disk (when you first FILE it), and subsequent use and re-filing of the same unit is done by reference to the initial filing not by creating a new set of data.

Caution: For automatic editing to work correctly, the component drawing and related assembly drawings must ALL be on the same Library Disk. Thinking about this when you organise libraries can save a lot of work later.

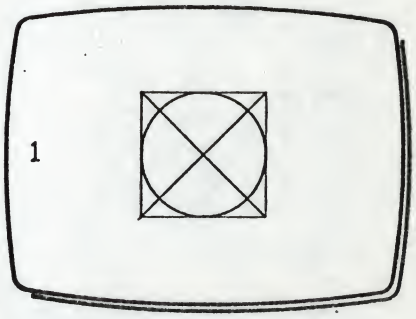


Fig 1

1 Clear the screen using WIPE.

2 Draw the shape in Fig 1.

3 FILE the drawing in an empty library box.

1 **Select LOAD from the Menu 2, and follow the sequence you have learned to retrieve your original drawing from the Library Index.**

2 **Alter the drawing as in Fig 4.**

3 **FILE the drawing INTO THE LIBRARY INDEX BOX IT CAME FROM.**

4 **Clear the Screen using WIPE.**

5 **Using COPY, check that the composite drawing now uses the modified component (Fig 5).**

Caution!: The Library Index is not updated, so the modifications to the composite drawing will not be visible there. To update the Library Index, use LOAD then FILE, to recreate the Index entry.

RECURSION - A TRAP FOR THE UNWARY!

You have seen that a Library Unit is stored only once on a given Library Disk. If it is used in another drawing, the system recreates the unit each time by referring to the initial filing instead of generating a new set of data.

This means, for example, a composite drawing assembled using a unit from Index A - Box 14, cannot be filed back to box A14 on the same Library Disk. That would mean an attempt to store in A14 a drawing which needs the original contents of A14, which would obviously be destroyed by the composite drawing.

This is 'illegal' to the system, and is known as RECURSION. If this situation occurs the 'Illegal File' error will be displayed by the system.

If you wish to file over the top of a unit with a modified version of itself, DO NOT USE COPY, use LOAD.

This particular procedure removes the identifying codes from the unit, causing the system to handle it as new data in all respects.

2.8 TUTORIAL 8

Tutorial eight deals with functions related to the screen display. Depending on the hardware equipment you have available, try as many of these exercises as you wish. The topics covered are as follows.

Saving a Screen Image as a 'snapshot' onto disk

Recalling a Screen Image previously stored

Printing a Screen Image on a printer

Full screen presentation

Photographing a Screen Image

Video recording the Screen Image

2.8.1 SAVING AN IMAGE

You have learned all the basic drawing functions during these tutorials, and have no doubt drawn and filed some impressive pictures along the way. Now it's time to explore some of the things you can do with your artwork.

You have seen how a drawing filed on the library disk can be handled as a re-usable unit . An important point here is that a drawing stored in the library using the FILE function is not stored as an image, but rather as a set of data instructions the computer uses to recreate the drawing by reconstructing it on the screen.

The system provides a second means of storing pictures on the library disk (but not the library index). This storage method is called SAVE.

1 **Draw or COPY a picture on to the screen.**

2 **Select SAVE from Menu 2.**

3 **Press and release L to confirm the selection. You will be asked to give the image a name.**

4 **Type a name of your choice, then press RETURN. The image will be saved to the disk.**

5 **Press and release L and R to return to the Work Page.**

The image has been stored as a complete entity - actually a mosaic of dots exactly as they appeared on the screen.

Because the image has been stored as a single unit, it cannot be manipulated using COPY or ZOOM functions. However, it can be recalled (instantly!), modified and used in other ways. The generated images may also be used with compatible software packages such as SLIDESHOW PROGRAMMER.

2.8.2 RECALLING AN IMAGE

Having saved an image you need to know how to get it back on to the Work Page.

1 **Clear the screen using WIPE.**

2 **Select LIST from the Menu, press and release L to confirm. A list of all named images on the disk will appear.**

3 **Note the name of the image you wish to recall.**

4 **Press and release L and R together to return to the Work Page.**

5 **Select VIEW from the Menu.**

6 **Press and release L to confirm. You will be asked to name the image to be recalled. (If you already knew the image name you could have gone directly to view it).**

7 **Type the name, then press RETURN.**

8 **Press and release L and R to return to the Work Page.**

Note: All the normal drawing function - including text - can now be used to alter the image. For instance, you can erase whole areas using a black nib, and you can make free-hand additions using TRACE.

Although the image is on the screen, there is **no data in memory**, so selecting PAGE will not redraw the image, but you can add detail to the image and save it again.

LIST

All the images that you save are listed on the Image Catalog. You can select LIST from the UTILS menu to get a list of the saved images at any time.

You also have the option of deleting any unwanted images by pressing T and entering the image name.

TRY DELETING THE IMAGE YOU HAVE STORED BY SELECTING LIST AND FOLLOWING THE SCREEN DISPLAY.

2.8.3 PRINTING AN IMAGE

The system includes automatic facilities for printing ('dumping') the image on an appropriately equipped dot matrix printer. The printer reproduces the image as a dot mosaic exactly as it appears on the screen (coloured areas appear as tone patterns on a monochrome printer).

1 **Switch on the printer, set to ON-LINE, and load it with paper.**

2 **DRAW or LOAD an image onto the screen.**

3 **Select PRINT from the Menu, and press and release L to confirm.**

Note: The image is printed without Menu and palette.

2.8.4 FULL SCREEN PRESENTATION

For photographic and other direct-from-screen applications, the image can be automatically enlarged to fill the entire display, eliminating the menu and palette.

1 **DRAW or COPY a picture onto the screen.**

2 **Select CLEAR from the Menu, press and release L to confirm. The image will be re-drawn full screen size.**

There's no menu, so now what? Press the T button to go directly to SAVE (i.e to save the image without Menu or Palette), or press L and R to return to the Work Page.

Note: The FULL SCREEN image proportion is not the same as the Work Page proportion. When CLEAR is selected a small strip will be lost from the bottom of the image compared with the original Work Page drawing. Therefore, when generating images for use with FULL SCREEN, do not use the full depth of the Work Page.

2.8.5 PHOTOGRAPHING AN IMAGE

Special photographic units are available for recording the screen image on 35 mm slides or instant prints. Most such units are expensive and are intended for professional use. However, very acceptable results can be achieved by photographing the display screen with an ordinary camera. Photo quality depends on many factors, including ambient light level, monitor performance and choice of film.

2.8.6 VIDEO RECORDING AN IMAGE

Whatever appears on the screen can be recorded direct onto videotape, this applies equally to static images (such as title pages) and dynamic replay sequences. The video output is available in three forms from the computer, either direct (Composite Video), RGB, or UHF video. Some attenuation of the signal may be necessary depending on the choice of video recorder and interface.

2.9 TUTORIAL 9

Tutorial nine is the first tutorial which deals with the Precision functions available with the system from Menu 2. This first tutorial covers general points you need to know for the remaining tutorials.

Introduction to Precision Drafting

Lock Functions

Escaping from a Lock

Using WIPE in the Lock condition

Cancelling a Lock Condition

Freehand Drawing with a Lock Engaged

Orthogonal Angle Lock

2.9.1 INTRODUCTION TO PRECISION DRAFTING

You have seen in earlier tutorials how the system can be used as a powerful sketching, or freehand drawing tool. But that's really only the beginning. You have at your disposal a range of precision aids, available through Menu 2. You will find them essential if you intend to create your drawings to a high technical standard. End points will be accurately defined, lines will meet where they are supposed to, curves will blend smoothly, parallel lines will be just that, and text will be consistent in size and position. With the precison aids on Menu 2 you will find that your drawing jobs go faster, with less repetition than before.

2.9.2 LOCK FUNCTIONS

Menu 2 provides lock functions which control movements of the drawing cursor in specific ways, depending on the type of lock you have selected. For example, you could position the cursor precisely at any chosen point on the work page, or you could make the cursor move only along a particular line.

With Menu 2 on the screen, you can still access all the palette functions you used in freehand drawing. However, if you have engaged a lock function from Menu 2, you cannot change a menu or palette selection without first suppressing the lock condition.

Why are we telling you this before you have even seen a lock? Because, literally , you can lock yourself into a condition where you can't do anything else unless you know how to get out of it!

2.9.3 ESCAPING OR TEMPORARILY SUPPRESSING A LOCK

If any lock function is in effect, the cursor cannot move freely outside the Work Page to make Menu and palette selections. To free the cursor, you must first press and hold the right hand button on the controller (press and hold R).

Then you can move XY to select the desired function on menu or palette, and then release the button (Release R). Releasing R has the effect of 'arming' the lock system again. When you move the cursor away from your menu or palette selection, you will find that the lock is re-armed.

For Menu selections , you release R, then confirm selection in the usual way by press and release L. Here is a summary:

LOCK SUPPRESS/FUNCTION SELECT

Unlock	Press and hold R
Select	Move XY to menu/palette
Arm	Release R
Confirm	Press and release L (Menu only)

2.9.4 WIPE IN THE LOCK CONDITION

The above procedure works for WIPE too, the only difference being that to confirm WIPE you press and release L and T together. The lock is automatically cancelled by WIPE, which is in effect a general system reset.

2.9.5 CANCELLING A LOCK CONDITION

Lock cancellation is similar to suppression, with one difference, to select 'cancel' you return the cursor to the LOCK indicator, which is already engaged. Release R, then switch off the lock by pressing L. Here is a summary:

LOCK CANCEL

Unlock	Press and hold R
Return	Move XY to lock flag
Arm	Release R
Cancel	Press and release L

Remember these details of Lock Suppression and Cancellation. You may need them!

2.9.6 FREEHAND DRAWING WITH A LOCK ENGAGED

You can draw 'unlocked' with any of the lock functions engaged. With DRAW selected, holding down R will unlock the cursor, allowing it to be moved. To draw, press and release T while continuing to hold down R, then release R. The Draw function will be executed as soon as R is released. Here is a summary:

1 Ensure that DRAW is selected.
2 Press and hold R to free the cursor.
3 Move XY to the position desired.
4 While still holding R, press and release T to draw.
5 Release R to execute the DRAW function.

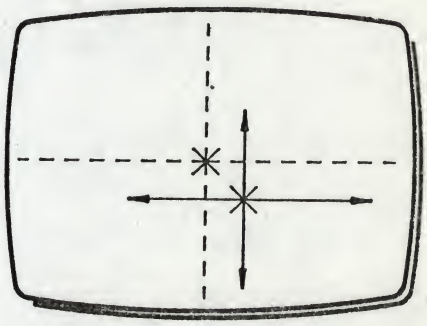
The TRACE cursor is always unlocked while actually drawing, (T held down). To TRACE from an unlocked origin:

1 Ensure TRACE is selected.
2 Press and hold R to unlock the cursor.
3 Move XY to the start position desired.
4 While still holding R, press and hold T.
5 Release R, still holding T, to draw.

This may seem a little complicated, but with use you will become familiar with the sequence. However, remember you can always switch a lock off, draw unlocked, then switch it on again.

2.9.7 ORTHOGONAL ANGLE LOCK (0-90)

This lock constrains the cursors to move only in two fixed 'grooves' originating at the origin cursor.



1 Clear the screen using WIPE.

2 Select Menu 2.

3 Move XY and press and release L to switch on the top 0-90 flag (Fig 1).

4 Now try moving XY, the cursor can move only along two axes passing through the origin cursor (Fig 2).

The angle of each axis, referred to the horizontal, is displayed on the menu. The X (East-West) axis is at 0 degrees, and the Y (North-South) axis is at 90 degrees.

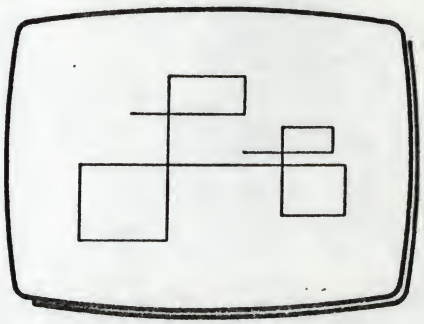


Fig 3

5 Move the dynamic cursor away from the origin cursor, then press and release L to shift the lock origin (i.e. the origin cursor).

6 Draw a number of lines and boxes as in Fig 3. They are all perfectly right angled, which is a very useful feature, don't worry if the joins are not exact - there is another lock function for this.

7 Press and hold R to unlock the cursor, then move XY to move the cursor freely. Press and hold L, release R, then release L to reposition the origin cursor.

Note: So long as R is held down, the cursor can be moved anywhere on the screen, including the Menu and palette.

2.10 TUTORIAL 10

This Tutorial introduces another series of functions which use grids to assist in drawing. The following topics are covered.

Locked Grids

Using a Grid

Drawing schematics using a Grid

Copying into a Grid

Zooming with a grid

Arcs with a Grid

2.10.1 LOCKED GRIDS

Two different grids can be displayed on the screen as aids to precision drafting, just as you would use a transparent ruled overlay or graph paper. The grid appears as a matrix of 'lock points' on the Work Page.

When a grid is engaged, the cursor can no longer move freely about the screen, instead it jumps from lock point to lock point, and cannot go anywhere else. This makes it very easy to draw with zero error to and from the accurately defined nodes of the grid - something you will appreciate when you make precision drawings, and notice that lines supposed to meet at a point do exactly that!

GRID DISPLAY

The screen display is itself a grid - a fine mesh to be sure, but a grid just the same. If you draw a vertical straight line you will see that it isn't continous, but instead is a column of individual points, called pixels. On the display there are 280 columns of pixels, and 192 rows. However, 24 of these columns are needed for the system menu, so the active work page is 256 across (the X dimension) by 192 down (the Y dimension).

By convention we number these starting from the top left corner of the screen.

2.10.2 USING THE GRID

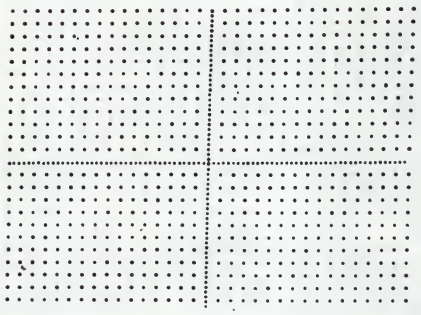
There are two grids on Menu 2 designated '8 X 8' and '4 X 4'.

Both of these grids automatically originate at the centre of the screen no matter where the origin cursor happens to be when the grid is selected.

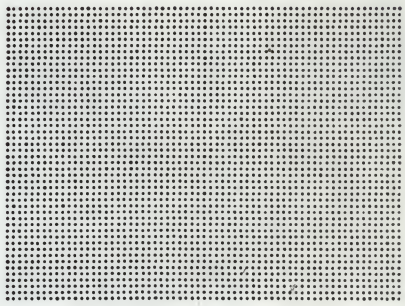
This feature can be used to find the centre of the screen. It also provides a register grid which always appears in the same position on the Work Page.

The spacings of the two grids are chosen for two reasons. First, they are very convenient for general drawing assignments, and second, they divide exactly on to the dimensions of the Work Page.

The grids are fixed at 0 and 90 degrees, and cannot be skewed or rotated.



8x8 grid



4x4 grid

When either of the grids is displayed, the column of lock points on the extreme right is hidden by the menu, and the row along the bottom is hidden by the palette.

Although they are not displayed, these lock points are effective, and can be used in the normal way.

Fig 1

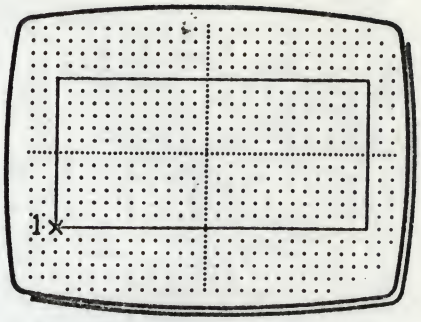


Fig 2

1 Clear the screen using WIPE. Notice that the origin cursor is in the centre of the Work Page. Leave it there for the present.

2 Select Menu 2.

3 Move XY to illuminate the 8x8 flag and press and release L to switch it on (Fig 1). A locked 8x8 grid appears on the Work Page.

4 Move XY and press and release L to position the origin cursor at (1) in Fig 2, and draw a rectangle.

5 Continue drawing lines between lock points for practice.

6 Press and hold R to unlock the cursor, then move XY to the 8x8 flag. Switch the 8x8 flag off by releasing R, then press and release L. The grid disappears, leaving small holes in your drawing where the lock points were.

7 Select Menu 1, then select PAGE to replay the drawing without holes.

2.10.3 DRAWING SCHEMATICS USING A GRID

Here we will use the 8x8 grid to draw a figure which we will use as a dummy symbol to illustrate the principles of drawing schematics.

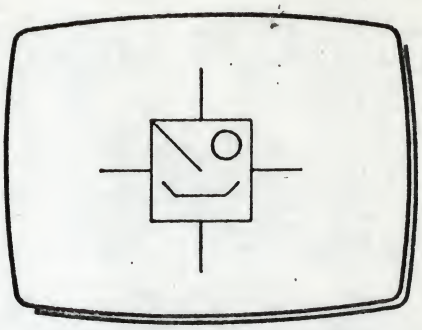


Fig 1

1 Clear the screen using WIPE.

2 Select Menu 2.

3 Select 8x8. A grid with crossed centre lines will appear.

4 Draw a square as shown in Fig 1, centred on the screen, 16 units each side.

5 Draw the 'dummy symbol' as shown in Fig 1.

6 Add vertical and horizontal 'connecting wires' from each side, extending to the limits of the grid.

7 Select Menu 1, then select FILE.

8 FILE the drawing in an empty library box.

11 Skip the label request.

You can assemble copies of the dummy symbol into a schematic on the 8x8 grid, using COPY and ZOOM functions, which act in a special way on this particular grid. To see just how easily a schematic can be assembled, try the next exercise.

2.10.4 COPYING ON TO A GRID

When using COPY on a grid, the scale of the copy cursor can only be altered in quantized steps. This ensures perfect registration and consistent size of symbols.

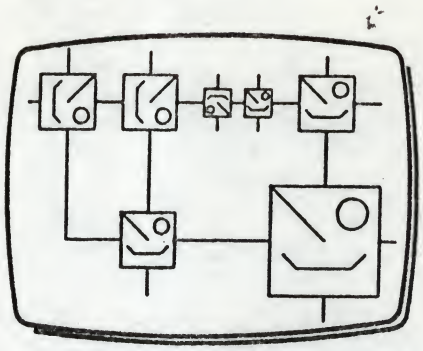


Fig 1

1 Clear the screen using WIPE.

2 Select Menu 2, then select 8x8.

3 Select Menu 1.

4 Select COPY, then select the shape you just filed.

5 When the Work Page returns, rotate Z to adjust the size of the cursor frame. You'll see that it jumps from one size to the next in fixed steps (watch the SCL value), instead of the usual smooth progression.

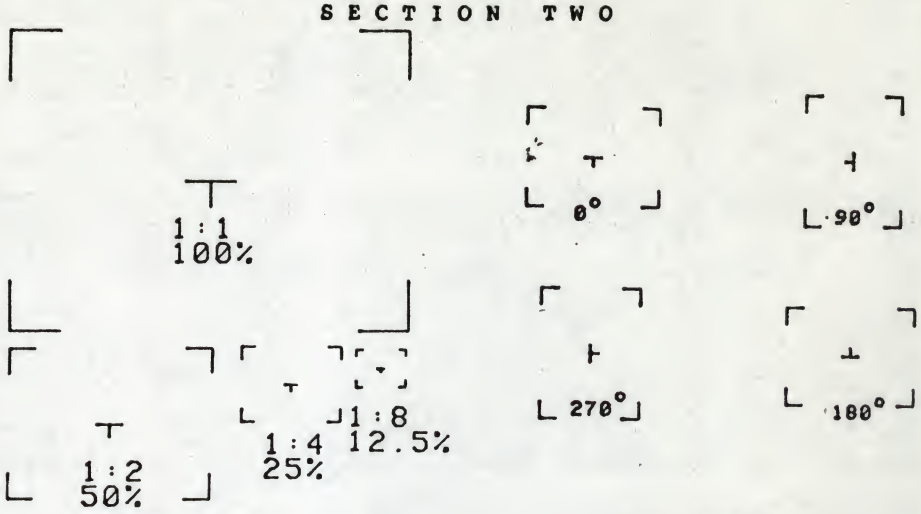
6 Now try to move XY to move the cursor frame about the Work Page, notice that the centre of the frame always homes on to a lock point.

7 Press and release T to plant different size copies of the symbol at various positions on the grid. Notice how the 'connecting wires' align easily.

8 Exit from COPY.

QUANTISED COPY RATIOS

You have seen how the COPY cursor frame has only a limited number of settings when a grid is in effect. These settings define the ratio of the library unit's original size, and its size as copied onto the screen. The four ratios available are 1:1, 1:2, 1:4, and 1:8.



Four sizes Four rotations

Here are the other COPY functions with the grid.

ROT The COPY cursor frame can be rotated through only four fixed settings when used with the grid 0, 90, 180 and 270 degrees. To rotate the cursor frame, press and hold L and rotate Z.

STR This is not available with the grid.

FLIP This operates in the usual way. To activate FLIP, press and hold R then select X or Y using the centre of the cursor frame.

2.10.5 ZOOMING WITH A GRID

As with COPY, the size of the ZOOM cursor (and therefore the magnifications available) is limited to four quantized settings, i.e. 1:1, 1:2, 1:4, and 1:8. You can, of course, zoom repeatedly for higher magnifications, 1:16, 1:32, etc.

This is helpful in two ways. First, it ensures perfect registration of the drawing on the grid, and second, it gives a 'nested' structure of locked grids within the grid on the base page, and so allows you to draw to precisely determined intermediate points.

You could try zooming on the schematic you drew in the previous exercise, but we suggest you do another drawing, this time using a dummy symbol with more than one connecting line on each side. This will show how useful it can be to ZOOM repeatedly to display successively finer grids.

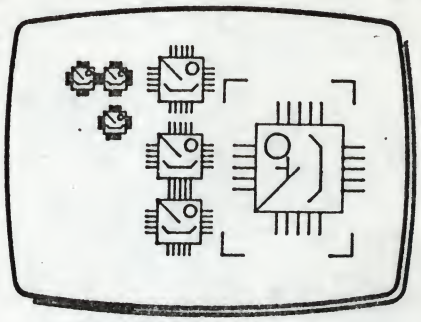


Fig 1

1 Clear the screen using WIPE and selecting the 8x8 grid, draw a symbol like the previous one but with 5 connecting lines at each side. Draw the lines to the edge of the grid, with a 2 unit spacing between lines.

2 FILE the completed symbol and clear the screen with WIPE, then reselect the 8x8 grid.

3 Plant different sizes of the symbol at various position as shown in Fig 1 (those at top left are at 12.5%).

Now we'll ZOOM on the smaller symbols.

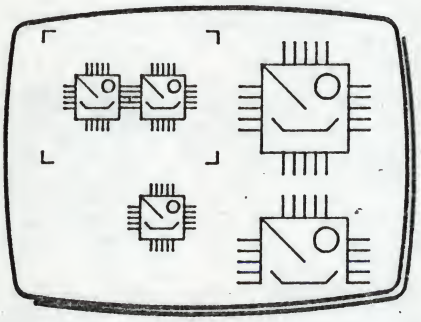


Fig 2

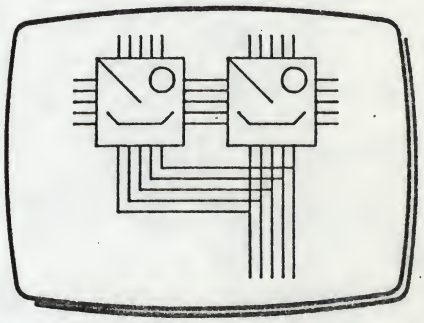


Fig 3

1 Press and hold R, then select ZOOM.

2 Rotate Z to adjust the zoom cursor frame. Just like the COPY cursor, it jumps from one size to the next (with a grid, the sizes available are the same for both ZOOM and COPY cursor frames).

3 Frame an area containing two or more of the smaller symbols, and press and release T to enlarge it (Fig 2).

4 Some of the connecting lines will be on lock points, some will not be, try ZOOM again to display a smaller scale with lock points on all the connecting lines. You may have to do this several times.

5 Exit ZOOM by pressing and releasing R and L together.

6 Using the grid lock points, make connections between symbols (Fig 3).

7 Press and hold R, then select PAGE to display the complete drawing, including the lines you just added.

2.10.6 ARCS WITH A LOCKED GRID

A locked grid can be used to generate precise, repeatable blending arcs and fillets.

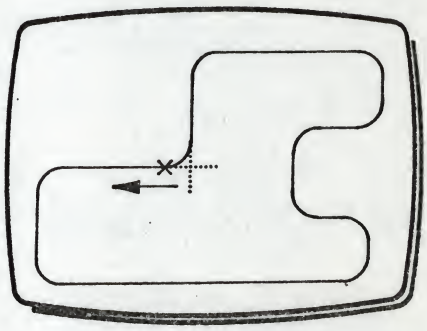


Fig 1

1 Clear the screen using WIPE.

2 Select Menu 2, then select 8 x 8.

3 Press and hold R, and select ARC from the palette.

4 Move XY to position the dynamic cursor on the lock point, 1 unit to the left of the origin cursor.

5 Press and release L to re-position the origin cursor, so defining the arc's direction.

6 Move XY to position the dynamic cursor 5 units to the left. Notice that the 'arc' is a straight line, this is because the lock points are perfectly aligned.

7 Press and release T to draw the line.

8 Move XY to position the dynamic cursor 1 unit down and 1 unit to the left. This forms a perfect 90 degrees corner radius.

9 Press and release T to draw the arc.

10 Move the dynamic cursor down 5 units, and press and release T to draw another straight line.

11 Continue drawing arcs and lines to complete the shape as shown in Fig 1.

POINT LOCK

The POINT lock function allows you to establish a single point for precise joining of lines. It is particularly useful in conjunction with the FIND function. POINT can also be used with COPY to Scale, Rotate or Stretch a copied item about a fixed point.

2.10.7 AUTOMATIC POSITIONING USING FIND AND POINT

This technique is often used to make precise joins to any previously drawn end points. You will find it a useful procedure to use.

1 Clear the screen using WIPE.

2 Draw two lines, as (1) and (2) in Fig 1.

3 Select POINT from the Menu and press and release L. The dynamic cursor is locked to the origin point.

4 Press and hold R and select FIND from the Menu, then release R.

5 Step back using L to the first point. Press T to establish this 'found' point.

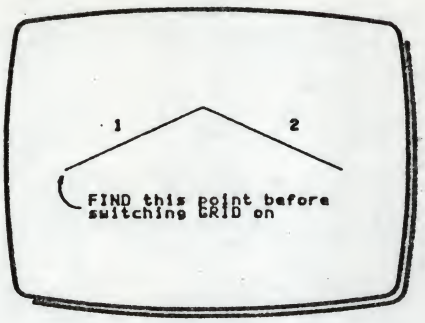


Fig 1

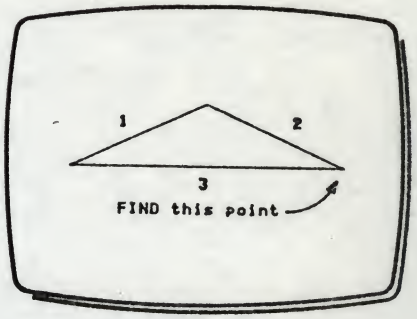


Fig 2

6 Press T to draw the line between the 'locked' point and the 'found' point.

7 Press and hold R and switch off POINT with L.

REMEMBER

'FIND and POINT' is an essential routine for precision drafting.

2.11 TUTORIAL 11

This tutorial covers various additional information and techniques which were not included in the basic and precision tutorials.

How the screen images relate to physical drawings

The Library Disk system

Archive Disks

Buffer Disks

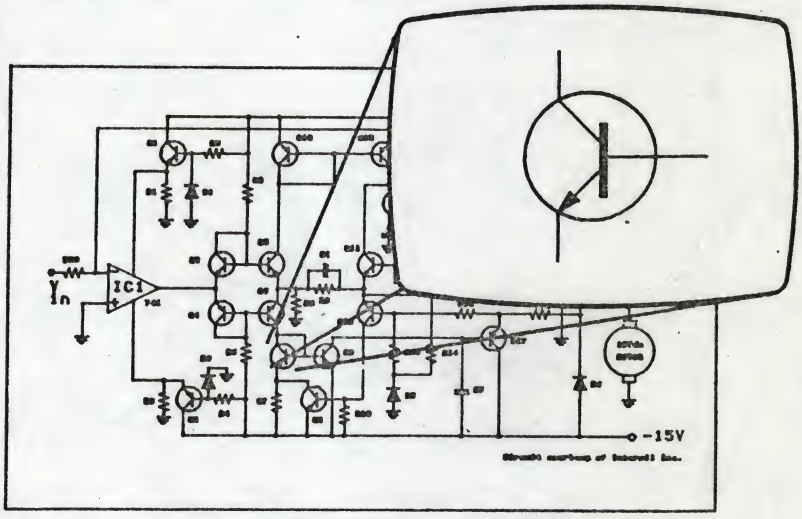
Hard Copy of Library Index Pages

2.11.1 HOW SCREEN IMAGES RELATE TO PHYSICAL DRAWINGS

When you draw a line with the system, the start and end points of the line are remembered by the computer as co-ordinates, i.e. horizontal and vertical distance from the bottom left corner of the Work Page.

The Work Page is potentially of enormous resolution, and you can access any part of it using ZOOM. However, the screen view of the Work Page, no matter what the zoom level, is limited to a fixed number of points, or pixels. This is known as the resolution of the screen.

The screen image always appears at this resolution (which accounts for irregularities in the display), but the resolution of your drawing on the Work Page, as it resides in the computer's memory, is practically unlimited.



The screen is just a window on the Work Page!

Although the screen view has limited resolution, ZOOM increases the co-ordinate resolution, allowing any level of detail to be added.

How much resolution do you need! The system allows you to draw with very high resolution, but experience will show you how far to ZOOM to produce drawings of the desired accuracy.

2.11.2 THE LIBRARY DISK SYSTEM

How your drawing is stored

One of the system's most powerful features is its library system for data storage and retrieval.

The key to the library, both for you and the computer, is the Library Index. This gives the user a visual catalog of the library contents, and it also provides an elegant means for the computer to identify any element simply by its location on the page. Remember that to FILE a drawing on the disk, you need only point to the chosen index box then press a button.

The drawing you create on the screen is handled by the computer as a set of instructions based on coordinate points rather than as a shape, or mosaic of pixels. This set of instructions is used by the computer both to re-generate the drawing on the screen and also to effect COPY transformations such as position, scale, rotation, etc.

When you FILE a drawing, the set of instructions relating to that drawing is identified by the computer by its location code in the library, not by its visual appearance. This code is generated automatically by the computer when the library unit is filed.

This is not the same as the 'personal' label, such as a dimension or drawing number, which you may assign to a library unit via the keyboard. The personal label appears on the index page as a visual reminder only, and has no meaning to the computer.

The code contains three elements,

1. **Library volume number (1 through 254).**
2. **Index page identifier (A, B, or C).**
3. **Box location number (0 through 64).**

The coding system allows the computer to recognize almost 50,000 unique library locations, provided each of the library disks is assigned a unique volume number.

FORMATTING YOUR OWN LIBRARY DISKS

'Format' means the arrangement of the empty index pages on the disk. Before a standard off-the-shelf 5 1/4 inch floppy disk can be used as a library disk, it must first be formatted, and this is provided for on the Systems Menu and covered in detail in Section 3 of this manual.

Before starting a proper drawing session, make sure you have enough formatted User library disks.

Choosing the number of index boxes

You should tailor the index pages to suit your application, i.e. large boxes 4 to the page, for large drawings; small boxes, 16 or 64 to the page for small symbols and letters. It's a good idea to have at least one 16 box page on each library disk.

Choosing the Volume Number

Your numbering system for Library disks is very personal! Here are some factors to consider.

1. The numbers available, i.e. recognized by the computer, for User Library disks range from 1 through 220.

2. There is no limit to the number of sets, each of 220 disks, so long as two volumes with the same number from different sets are not used in the one drawing session. (The computer cannot distinguish one set from another, i.e. it cannot differentiate between two library units coded Volume 5, Index A, Location 6.)

3. If there is no need to catalog, or structure the stored material, you can use any numbering system you like, provided you bear in the mind the above.

4. If you know in advance the extent of your pictorial data base, you can pre-allocate volume numbers for future work, e.g. Volumes 1 through 10 for electrical symbols, 11 through 20 subassemblies, 21 through 25 for standard text blocks, etc.

PRE DRAWN LIBRARY DISKS

Volume numbers 221 to 253 are reserved for pre-drawn Library Disks and therefore should not be used for the user's own libraries.

2.11.3 ARCHIVE DISKS

FORMATTING YOUR OWN ARCHIVE LIBRARY DISKS

User library disks are intended both for active source material and finished work. The Archive disk is different, in that it is intended mainly as a store for a completed drawing, perhaps together with related amended versions, which you wish to preserve, but will not use as part of another drawing.

All archive disks have the same volume number 254, automatically assigned by the system and are limited to 16 or 4 box indexes.

Using the Archive Disk

Drawings can be filed onto an archive disk in two ways.

1 Direct from the screen. When drawing is completed on the screen, replace the user library disk in the current Library drive with the archive disk. Then FILE the drawing in the normal way, and replace library disk.

2 From another library disk. If the completed drawing has already been filed on a user library disk, transfer it to screen using LOAD, then proceed as above.

Note: For editing purposes, you can recover a drawing from the archive disk using LOAD. Amend it, and then return it to the archive disk. You can either overwrite the old drawing, or place the amended version in a new box.

2.11.4 BUFFER DISKS

Buffer Disks are formatted by selecting the option from the System Menu and following the prompts given. As with any disk, it should be stored properly when not in actual use. Do not leave it in the drive for long periods when the system is not being used!

Note: You should replace the Buffer Disk periodically.

2.11.5 HARD COPY OF LIBRARY INDEX PAGES

If there is a printer available, you will find it helpful to make a printed ('hard copy') version of units stored on your library disks. The printed version can be filed separately, or together with the disk itself. Thus, you will not need to load the disk to confirm what it contains, but simply refer to the printed copies of its index pages.

1 Switch on the printer, load it with paper, and set it ON-LINE.

2 Select LIST from Menu 2, then press and release L to confirm. A list of all named screen images on the library disk will appear, the first three being library index pages A, B, and C.

4 Press and release L and R together to return to the Work Page.

5 Select LOAD, and press and release L to confirm.

6 Enter A, B, or C as required, then press RETURN key.

7 Select PRINT, and press and release L to confirm.

SECTION TWO

3.0 INTRODUCTION

Section 3 of the manual provides the means for users familiar with the system to refer to information directly by topic or function. It is assumed that readers of this section have completed the introductory tutorials.

Contents The reference section is organised into sub sections each covering a specific topic or function. Where a topic covers several functions of importance, they are indicated by subject within sub section.

Sub sections In general, each sub section is broken down into a brief function description followed by details of selection, operation and exit. These elements are repeated if there are several functions described.

Notes Additional or special points to note are indicated in the text by 'Note:'. 'Caution!' is used in the text to indicate a note of special importance.

Terms and Abbreviations Used A list of terms and abbreviations used in this section follow this introduction.

TERMS AND ABBREVIATIONS USED

Bitstik Controller

XY	Refers to left/right/up/down movement of the joystick control
Z	Refers to rotation of the knob in the centre of the joystick
T	Refers to the top button (coloured red)
L	Refers to the left button (coloured white)
R	Refers to the right button (also coloured white)
L and R	Refers to left and right button together
L and T	Refers to left and top button together

Origin Cursor	Refers to the origin cursor, the 'x' shaped cursor
Dynamic Cursor	Refers to the dynamic cursor, the '+' shaped cursor

3.1 SYSTEM MENU

This section describes how to start the system and prepare the disks required. If the system is being used for the first time, ensure copies of the Introductory Library disk supplied are made **BEFORE** continuing with tutorial exercises. Refer to the Apple DOS 3.3 User Guide for details on making copies of disks.

Also, a number of LIBRARY and ARCHIVE disks should be formatted to store any drawings created with the system. See Section 3.2 which describes their function and creation. Ensure a minimum of one Buffer, one Library and one Archive disk are prepared before running the Graphics System.

To load the System proceed as follows:

1 **Insert the System Master Disk into Drive 1 and close the flap. Turn on the monitor and then the computer.**

2 **The disk drive will run for a few seconds with the 'in use' light illuminated. A title page will then be displayed, with the System Menu listing the available options.**

3 **Select the required option by entering the number indicated via the keyboard, and follow the prompts given. The options available are listed below.**

SYSTEM MENU OPTIONS The System Menu options are

1 Run Graphics System (see below)

2 Format Library Disks (Sect 3.2.1)

3 Format Archive Disks (Sect 3.2.2)

4 Format Buffer Disks (Sect 3.2.3)

5 Set up Controller

6 Set up Printer

7 Set up Digitiser

8 Exit (to DOS)

Options 5 - 7 are only used to configure the system and therefore are covered in detail in Section 1.

RUN GRAPHICS SYSTEM

When the Graphics System is selected, a message is displayed indicating the program is loading. When loaded, a prompt is given to insert a Library or Archive Disk in Drive 1 and the Buffer Disk in Drive 2. After loading the appropriate disks, press the RETURN key to proceed.

CAPACITY OF THE LIBRARY DISK

In the system, drawings are stored in a highly compressed form. Exactly how many drawings you can store on a single disk depends on the complexity of the subject, i.e. the number of lines used and the number of times the same library unit is repeated.

A single library disk can store entries for approximately 12,000 straight lines of any length, or a slightly lower number of curve and text entries.

Although unlikely, this limit could be reached by only one or two drawings, if they contained a very large number of detail entries. In this case would be full but there would be many empty boxes on the index pages.

Typically, however, most of the index boxes will be used before the disk is filled if you use the disk in an appropriate way - large boxes for large drawings, small boxes for small drawings etc.

USING LIBRARY DISKS

As you use the the system, you will very quickly build up in Libraries a large number of drawings at various stages of completion, as well as other symbols, sketches, grids and blocks of text. An organized approach from the start will save you a lot a time, and also help avoid the grief of accidental erasure.

The library system can be used in the same way as the physical plan file found in conventional design office. But more than that, the library disk is a pictorial catalog (a bill of material, if you like) of all the component parts or stages leading to a finished drawing. A library disk can in fact be the single source for all the information pertaining to a particular project.

Although all library disks are organized in a similar way, they fall unto three distinct categories,

1 Library disks, volumes 1 through 220 (for your own source material).

2 Library disks, volumes 221 through 253 (reserved for pre-drawn source material).

3 Archive disks, volume 254 (a generic number for an unlimited category of disks used for finished work).

3.2 PREPARING AND FORMATTING DATA DISKS

The System Master disk supplied with the system contains the programs which operate the system, and is not used to store any data created by the user.

The system uses three types of data disks which must be prepared according to their use, **before** storing data on them. They are Library and Archive disks, which are used to store complete or component drawings, and a Buffer disk which is used as temporary storage during the compilation of a drawing.

LIBRARY DISKS Up to 253 Library Disks are available to the user, numbered from 1 to 253. Of these, 24 numbers (221-253) are reserved for pre-drawn libraries, and these numbers should not used for the users own libraries. Each Library Disk has three pictorial indexes labelled A, B, and C. In each index entry, a scaled down image of the drawing stored is shown. To allow for the complexity of different stored drawings, the maximum number of entries in each index may be specified by the user, either 64, 16 or 4.

ARCHIVE DISKS The Archive Disk is a special kind of Library Disk they can be used **only** for storage of completed drawings. This gives the user the ability to create a library of finished work without utilising normal library disks.

BUFFER DISKS A Buffer Disk is required for temporary storage whenever the graphics program is used. For system use only one is necessary, however each user may choose to have their own buffer disk if preferred.

Caution!: Data disks must be 'formatted' before they can be used, as described below. It is advisable to make a supply of pre formatted data disks of different types in case a disk becomes full in the middle of a drawing session.

3.2.1 LIBRARY DISKS

To format a Library Disk, proceed as follows:

1. **Select option 2 on the System Menu.**
2. **Insert a new disk in Drive 2, and close the flap.**
3. **Enter the 3 digit Volume Number you wish to allocate to this Library Disk and press the RETURN key.**
4. **Enter the format for Library Index A (64, 16 or 4 slots).**
5. **Repeat for Library Indexes B and C and then press the RETURN key.**
6. **The disk drive runs while formatting takes place.**

7 When complete, the System Menu is displayed and another Library Disk may be formatted if required.

Note: Remember to label the formatted Library Disk with the Volume Number allocated.

3.2.2 ARCHIVE DISKS

To format an Archive Disk, proceed as follows:

1 Select option 3 on the System Menu.

2 Insert a new disk in Drive 2, and close the flap.

3 Select the index format for each index (16 or 4 slots), and press the RETURN key.

4 The disk drive runs while formatting takes place.

5 When complete, the System Menu is displayed and another Archive Disk may be formatted if required.

Note: The system allocates Volume Number 254 to all Archive Disks.

3.2.3 BUFFER DISKS

To format Buffer Disks proceed as follows

1 Select option 4 on the System Menu.

2 Insert a new disk in Drive 2, and close the flap, and press the RETURN key.

3 The disk drive will run while formatting takes place.

4 When complete the System Menu is displayed.

3.10 MAIN FUNCTIONS (Menu 1)

FUNCTION Menu 1 provides the main system functions. These are grouped according to their overall uses, as follows:

DRAW, PAINT, TRACE and TEXT are the origination functions.

FILE and COPY are the library access functions.

ERASE, FIND, MOVE, DUPL and EXCH are the editing and manipulation functions.

ZOOM, PAN and PAGE are the viewing functions.

WIPE is a utility to clear the screen, and reset the system.

EXIT To access Menu 2, which provides additional manipulation of the primary functions, select 'MENU'.

3.11 DRAW

FUNCTION The DRAW function, which is used in conjunction with the Draw Palette, provides the basic drawing operations. Lines, points, arcs and circles can all be drawn in different colours and with different line types (continuous, dotted, etc). Nibs, of definable pen strokes, can also be used.

SELECTION The DRAW function is the 'default' state, That is, when the system is loaded and Menu 1 displayed, this function is automatically selected. Similarly, after exiting other functions, DRAW will again become active. Selection of different data and line types is by XY movement into the Drawing Palette.

3.11.1 LINES AND POINTS

FUNCTION Just as DRAW is the default function, so LINES is the default data type on the Draw Palette.

OPERATION To draw a line, first postion the Dynamic Cursor at the desired point of origin using the XY Control. Then press L, which causes the Origin Cursor to jump to this selected position. Now move the Dynamic Cursor to the point at which the line is to end. Press T and the line will be plotted in the colour and line type specified on the Draw Palette.

Note:
The Origin Cursor automatically updates to the new position of the Dynamic Cursor. To continue drawing from a new point, move the Dynamic Cursor again, before updating the position of the Origin Cursor by pressing L.

To plot a single point, position the Dynamic Cursor at the required location, update the Origin Cursor by pressing L, then plot the point by pressing T.

EXIT To select another data type move the Dynamic Cursor to the required option and the indicator will jump to that choice. Now move the cursor away vertically.

3.11.2 ARCS

FUNCTION Arcs can be drawn from a point on the circumference.

SELECTION Select Arc from the palette.

OPERATION On selection, a 'rubber-banded' arc is displayed, blending from the previous end-point. You can set the arc by moving the XY Control to the required position. Press T to plot the arc.

If required, you can draw another arc by following the procedure above. If the arc is almost flat, it will default to a straight line. Similarly, if no direction has been given for this arc, a straight line will be drawn.

Note: An arc can be started in 'free space' (not connected to a previous data point) by updating the Origin Cursor twice along the required arc direction.

EXIT To exit, select another data type with the Dynamic Cursor.

3.11.3 CIRCLES

FUNCTION Complete circles may be drawn in a single step with this facility, without using arcs.

SELECTION Select Circles from the Draw Palette.

OPERATION The Dynamic Cursor is replaced by the Circle Cursor. Its centre is moved using the XY Control while the diameter is varied by rotating the Z Control. To draw a circle, move the centre of the Circle Cursor to the required position, set the diameter and deposit the circle by pressing T. The drawn circle will not become visible until the Circle Cursor is moved away.

EXIT To exit, select another data type with the cursor.

3.11.4 NIBS

FUNCTION In this mode the normal Origin and Dynamic Cursors are replaced by two Nib Cursors. The Dynamic Nib Cursor is an extendable line. At the right hand end of the Dynamic cursor is a small diamond shaped marker, indicating the 'active' part of the cursor for menu and palette selection. Drawing between Origin and Dynamic cursors in this mode produces 'block' drawing between the two cursor positions.

SELECTION Select Nibs from the Draw Palette.

OPERATION The Dynamic Nib Cursor is a single line whose length is adjusted by rotating the Z Control. Cursor angle is adjusted by holding down R whilst rotating the Z control. Release R when the desired angle is reached.

The Nib Cursors work in a similar way to the Origin and Dynamic Cursors; the Origin Nib can be updated to the Dynamic Nib's position by pressing L. This now defines the start position, length and angle of the nib stroke. The Dynamic Nib is then moved to the required position (adjusting length and angle if desired). To fill in the area between the two cursors, press T. The nib stroke is drawn in the colour and line type selected on the palette.

By selecting different line types the spacing across the width of the stroke can be varied. The spacing along the length of stroke (Nib Type) can also be adjusted by moving the XY Control to the Nib Type Indicator on the palette, and holding down L. Rotate the Z control to adjust the block to the right of the indicator from solid (the default state) to a maximum spacing of 5 points. Release L to set the length spacing.

A variety of nib textures can be achieved using combinations of line and nib types, from a solid area of colour to a field of dots.

EXIT To exit Nibs select another data type with the 'active' cursor.

3.12 PAINT

FUNCTION The PAINT function enables you to colour-fill any completely enclosed area using the special 16-colour Paint Palette.

SELECTION Move the Dynamic Cursor to the PAINT legend on Menu 1 and press L. The legend illuminates when selected and the Paint Palette replaces the Draw Palette.

OPERATION Select the required colour from the palette with the Dynamic Cursor. Move the cursor into the area to be painted and press T. The enclosed area will be filled with the selected colour.

Caution!:
An attempt to fill any area not fully enclosed will cause a leak of colour through the gap.

If black has been selected, the PAINT function will erase the entire shape, including anything connected to it by a line.

Note:
In ZOOM, areas might be opened up causing leakage of colour to occur. Similarly, after using ERASE or erasing a grid gaps may be caused in existing entries; if this happens use PAGE to regenerate the drawing intact.

If you PAINT a shape under ZOOM, ensure that it is applied at the same ZOOM level. Otherwise it is possible that because the entries are not at the same level, the colour will leak and fill the screen.

EXIT To exit the PAINT function, apply the Dynamic Cursor to the DRAW legend and press L. The PAINT legend will switch off and the Draw Palette will replace the Paint Palette.

3.13 TRACE

FUNCTION The TRACE function enables the use of a Digitising Tablet as an additional drawing method. If a tablet is not available, the function allows freehand drawing in 'stream' mode using the Controller. In this mode a continous freehand line is drawn following the movement of the XY Control.

SELECTION Move the Dynamic Cursor to the TRACE legend and press L. The legend illuminates when selected and the cursor changes to a small dot.

Thereafter, two types of operation are possible.

OPERATION - TABLET NOT AVAILABLE To use this facility, move the Dynamic Cursor to the required start position. Hold down T. A continuous line will be generated as the XY Control is moved.

Note: Stream uses a lot of memory and should be employed sparingly. The system will beep when 1000 bytes of continuous stream has been entered, and will stop accepting input. To continue, release T and restart from the end point.

EXIT To exit, release T and reselect DRAW.

OPERATION - DIGITISING TABLET AVAILABLE Using the Apple Graphics Tablet, two tracing modes may be employed.

To trace in 'stream' mode:

1 Position the stylus at the starting point.

2 Press down with the stylus and trace to the end point.

3 Lift the stylus off the surface of the tablet to move to a new start point.

To trace in point-to-point mode:

1 Establish the start point by pressing the stylus down on the tablet surface.

2 Lift the stylus and move to the next point.

3 Press T on the Controller, and press down with the stylus at the new point.

4 Release T (keeping the stylus pressed down) to draw the line.

5 As required, continue the line to the next point or establish a new start point using the same methods.

Note: Menu and palette selection can be done in the usual way using the tablet stylus, pressing L to confirm.

EXIT To exit, select DRAW with the tablet stylus and press L.

3.15 FILE

FUNCTION The FILE function enables you to store the Work Page as a Library Unit on a Library or Archive Disk, for later use.

SELECTION Move the Dynamic Cursor to the FILE legend on Menu 1 and press L. The legend illuminates when selected.

OPERATION The Work Page is replaced by the current Library Index, and the Copy Cursor becomes active. If another index is required press R for the next index or L for the previous one.

The frame cursor can be moved around the Library Index to select a slot for filing the unit. Press T to deposit the unit, and store it for subsequent use. An existing Library Unit can be overwritten by a new unit if it is no longer required, and is then permanently erased from the Library Disk.

Having deposited the unit in the library, a prompt is presented allowing you to label the filed unit. The size of the label is dependent on the index format:

64 slot index - 5 characters can be entered
16 slot index - 9 characters can be entered
4 slot index - 19 characters can be entered

The label does not form part of the data, and is for reference use only. If you do not want to add a label, just press L and R simultaneously to exit.

Caution!:
If you want to FILE onto different Library or Archive Disks, simply change the disk (ensuring that you close the drive flap), **before** you select FILE.

You can produce Library Units with up to 16 levels of 'nesting' i.e., the inclusion of further Library Units, which include further Library Units and so on, up to 16 levels. You should therefore be careful not to overwrite a Library Unit that has been used elsewhere (for instance, in the compilation of another 'composite' unit).

EXIT The FILE function is automatically exited after the labelling option.

3.16 COPY

FUNCTION The COPY function enables you to retrieve a previously stored Library Unit from a Library Disk to include in a drawing.

SELECTION Move the Dynamic Cursor to the COPY legend and press L. The legend illuminates when selected.

Any combination of parameter overrides is allowable.

SCALE is adjustable as a percentage of full size between 0.5 and 100 in increments of 0.5, with 100 representing full page scale.

ROTATION is adjustable from 0 to 355 in increments of 5 degrees, with a default of 0.

STRETCH is adjustable in the range 15 to 100 in increments of 0.5, with a default of 50. This represents a scale from full X-Stretch through normal to full Y-Stretch.

Having pre-set these values, they will continue to define the Copy Cursor until switched off or altered. To switch off, move the cursor to the legend, reselect and move away, and the marker will switch off.

3.16.2 X-FLIP and Y-FLIP

FUNCTION The X-Flip and Y-Flip options enables you to deposit the mirror-image of a Library Unit in the X and/or Y axes. The 'T' marker at the centre of the Copy Cursor indicates the two axes.

SELECTION Select X- or Y-Flip from the Copy Palette by moving the cursor down to the required option until the arrowhead marker jumps to the legend.

OPERATION Move the cursor away vertically, ensuring that the indicator remains 'on'. You can then deposit the Library Unit, as described above.

Note: You can set both X- and Y-Flip. This is equivalent to a 180 deg rotation.

EXIT To switch off the Flip option, re-select the option with the cursor then move it away vertically, and the marker will switch off.

3.16.3 COLOUR and LINE TYPE

FUNCTION This option allows you to override the colour and/or line type settings of all the data in a Library Unit, prior to placing it on the Work Page.

SELECTION Move the cursor to the colour or line type blocks on the palette. An arrowhead marker will indicate the selection.

OPERATION Hold down L and rotate the Z Control to adjust the line type or colour. As the control is rotated, four line types or six colours are displayed in sequence. When the required selection is displayed, release L and move the cursor away vertically, ensuring that the indicator remains 'on'. You can then deposit the Library Unit as described above.

To switch off the override options, reselect with the cursor and move it away vertically, and the marker will switch off.

3.17 ERASE

FUNCTION The ERASE function enables you to erase the last entry made to a drawing or to step back through the previous sequence of entries, to erase any that are not required.

SELECTION Move the Dynamic Cursor to the ERASE legend and press L. The legend illuminates when selected.

OPERATION The following cursors are used to denote the different entries:

LINES	Two Erase Cursors (diamond-shaped), for start and end points.
ARCS	Three Erase Cursors, for centre, start and end points.
CIRCLES	Three Erase Cursors, for centre and two points on the circumference.
NIBS	Four Erase Cursors at the corners of the nib stroke.
PAINT	Single Erase Cursor at original colour fill point.
TEXT	Four Erase Cursors at the corners of the text block.
COPY	Copy Cursor framing the Library Unit.
STREAM	Two Erase Cursors for start and end points.

To erase the last entry, press T. The entry will be **permanently erased** from memory.

Note:
If the last entry was a PAINT, the colour area will be erased from memory , but will remain on the screen until the Work Page is redrawn with PAGE or ZOOM.

To erase earlier entries you can step back through the sequence until the required entry is reached. To step back, hold down L and the Erase Cursors will successively define each preceding entry. Release L to freeze the cursors and the entry is erased by pressing T. Similarly, to step forward, hold down R, releasing when the required entry is indicated and again erase by pressing T. The step back or forward will speed up the longer L or R is held down.

Continuous ERASE can be achieved by holding down both L and T for a 'reverse erase', or with R and T for a 'forward erase'. When you reach the start of the sequence, you will 'wrap around' to the end of the sequence, and vice versa. If all entries have been erased in this manner, the ERASE function will be automatically exited.

When using ZOOM, both end points of an entry may not be on screen and the cursors will not be displayed. In this case use PAN to move across to include both ends, or apply an 'inverse zoom'.

You should be aware that the ERASE function paints out the entries with black. When this causes an underlying entry to be partially erased, the drawing can be restored with PAGE, ZOOM or PAN.

As Library Units are treated by the system as a single module, ERASE only erases the whole module. To erase part of a Library Unit, use LOAD, to regenerate the Library Unit as a Work Page. ERASE can then be used to delete entries within the Library Unit. Then re-file the edited Library Unit and later use EXCH to exchange the amended version for the original.

EDIT provides a similiar facility for Library Units used as components or sub-assemblies within composite drawings. However, the LOAD and EDIT routines WIPE the Work Page, so ensure that the Work Page is filed first to preserve it in its original form.

EXIT Exit ERASE by pressing both L and R simultaneously. The ERASE legend will switch off and the Erase Cursors will be replaced by the Origin Cursor at the last selected entry.

3.18 FIND

FUNCTION The FIND function enables you to determine the precise co-ordinates of the end points of entries. It can be used to make a precise new entry at a chosen point, or to set up an ARC.

SELECTION Move the Dynamic Cursor to the FIND legend and press L. The legend illuminates when selected.

OPERATION The Origin and Dynamic Cursors are replaced by the Find Cursor, which sequentially indicates the start or end point of lines; the start, end and centre of arcs; the centre and circumference of circles, and the four corners of nib and text entries.

The FIND function operates in a similar way to ERASE. You can step back through entries by holding down L or step forward by holding down R. Release when the required location is reached. As with ERASE, when you step back or forward to the start or end of the sequence, you will 'wrap around'.

If you want to FIND more than one point, use POINT to establish a point sourced from the Origin Cursor. You can then use FIND to obtain the other end point and can plot back to the locked point.

Note: This function is also provided on Menu 2.

EXIT To exit FIND, press T. The Origin Cursor will then be established at the 'found' point. To exit FIND **without** updating the Origin Cursor, press L and R together.

3.19 MOVE

FUNCTION The MOVE function enables you to move Library Units which have been previously deposited on the Work Page with the COPY function.

SELECTION Move the Dynamic Cursor to the MOVE legend and press L. The legend illuminates when selected.

OPERATION The Dynamic Cursor is replaced by the Copy Cursor, which frames the last Library Unit placed on the Work Page, and the Copy Palette replaces the current palette; providing controls for placing the Library Unit.

Step backwards or forwards through the sequence of previously deposited Library Units using L and R, as described for ERASE. To move the framed Library Unit, press T. The Copy Cursor enclosing the selected Library Unit will freeze and a new active cursor is displayed. Move the cursor to the new position, altering Scale, Rotation and Stretch, if required. You can lock parameters on the Copy Palette as described under COPY.

To deposit the Library Unit, press T. The entry will be erased from its current position and regenerated at the new position. If it is not correctly positioned, you can move again.

EXIT Exit MOVE by pressing L and R simultaneously.

3.20 DUPL (DUPLICATE)

FUNCTION The DUPL function enables you to pick up a previously deposited Library Unit directly from the Work Page and to deposit further copies on the same page.

SELECTION Move the Dynamic Cursor to the DUPL legend and press L. The legend illuminates when selected.

OPERATION The Dynamic Cursor is replaced by the Copy Cursor, which will frame the last Library Unit deposited on the Work Page. The Copy Palette replaces the current palette. To select an earlier Library Unit you can step backwards or forwards through the sequence of previously deposited units using L and R. To duplicate the framed Library Unit, press T. The Copy Cursor enclosing the selected unit will freeze and a new active cursor is displayed.

Note: You can also use the Copy Palette options when using DUPL. These options enable you to set and lock Scale, Rotation, Stretch X- and Y-Flip and Colour and Line Type overrides.

EXIT Exit the DUPL function by pressing both L and R simultaneously.

3.21 EXCH

FUNCTION The EXCH function enables you to identify a previously deposited Library Unit on the Work Page and to replace it with another unit from the library at the same Scale, Rotation and Stretch. These values cannot be altered during the EXCH operation.

SELECTION Move the Dynamic Cursor to the EXCH legend and press L. The legend illuminates when selected.

OPERATION On selection, the current Library Index is presented. Choose the Library Unit you want to substitute for the Library Unit (or Units) on the Work Page. Press T to select. The Work Page is then displayed with the Copy Cursor framing the last deposited Library Unit.

To identify an earlier Library Unit you can step backwards or forwards through the sequence of previously deposited units using L and R, as described for ERASE. When you have identified the Library Unit you want to replace, press T. The unit will be erased and replaced by the new Library Unit. If required, you can continue to step backwards or forwards to select another Library Unit for replacement.

EXIT Exit the EXCH function by pressing both L and R simultaneously.

3.22 ZOOM

FUNCTION The ZOOM function enables you to select an area on the Work Page and either expand it to full screen size or to contract the full screen into a defined area ('inverse zoom').

SELECTION Move the Dynamic Cursor to the ZOOM legend and press L. The legend illuminates when selected. The Origin and Dynamic Cursors are replaced by the Zoom Cursors.

OPERATION Move the Zoom Cursor to the area of the Work Page to be expanded. Set the zoom 'window' by rotating the Z Control. Press T and the area defined by the Zoom Cursor will be enlarged. If you rotate the Z Control further, the corners of the cursor will invert, indicating an inverse zoom. When positioned over the selected area and T pressed, the current view will be redisplayed in the framed area.

The display can be terminated at any stage by pressing the keyboard space bar.

Note:
You can successively apply the ZOOM function to the Work Page without any degradation of the picture structure. However, once you reach the extent of data resolution, you cannot apply any further zooms. Similarly, you cannot apply an 'inverse zoom' beyond full base page, if you attempt this there will be an audible warning.

If used with a GRID with either an 8x8 or 4x4 spacing, the Zoom Cursor will be quantised in scale (in x2 increments). On all grids, the origin of the Zoom Cursor is locked to the grid.

EXIT Exit the ZOOM function by pressing L and R simultaneously.

3.23 PAN

FUNCTION The PAN function enables you to move horizontally or vertically from a view generated by the ZOOM function.

SELECTION Move the Dynamic Cursor to the PAN legend and press L. The legend illuminates when selected.

OPERATION The Origin and Dynamic Cursors are replaced by the Zoom Cursor, which is fixed at full-page size.

Move the cursor horizontally or vertically to include the off-screen area you wish to be displayed. When set, press T to display the defined ares. As with ZOOM, you can terminate the display at any stage by pressing the keyboard space bar.

Note:
PAN can only be used on a zoomed view and not from the base page. An audible warning will be given if this is attempted.

For further control, PAN can be employed in conjuction with a Grid.

EXIT Exit the PAN function by pressing L and R simultaneously.

3.24 PAGE

FUNCTION The PAGE function redraws the Work Page. It is used after changes, erasures or for redrawing after using ZOOM.

SELECTION Move the Dynamic Cursor to the PAGE legend and press L. The legend illuminates when selected.

OPERATION On selection, the Work Page is redrawn at its original scale (base page).

EXIT Exit PAGE is automatic when the Work Page has been regenerated. Alternatively, PAGE can be terminated at any stage by pressing the keyboard space bar.

3.25 WIPE

FUNCTION The WIPE function clears the Work Page and 'resets' the system.

SELECTION Move the Dynamic Cursor to the WIPE legend on Menu 1 and press L and T.

OPERATION WIPE clears the memory of the sequence of entries added since starting and resets the memory counter.

Caution!: This command also resets the system default conditions and clears all buffer areas, including the buffer disk.

EXIT Exit from WIPE is automatic.

3.30 MENU 2 FUNCTIONS

Menu 2 presents precision controls and other functions.

The functions are :

Angle and Grid Locks - which can act like a set square, ruler, or variable graph paper to aid in the composition of a drawing.

Modification of previously drawn Library Units.

Screen Image functions

EXIT To access the main functions (Menu 1) select MENU.

3.31 ORTHOGONAL ANGLE LOCK (0-90)

FUNCTION This function constrains cursor XY movement to a 0 or 90 degree movement.

OPERATION First position the Origin Cursor at the location from which the Angle Lock should operate.

Move the Dynamic Cursor to the 0-90 legend. The legend will flash when selected. Press L and withdraw the cursor. The legend will stop flashing, but remains illuminated while the lock is on. The cursor is now restricted in its movement to the vertical and horizontal angles. Override the lock by holding down R.

Note: LOCK OVERRIDE Once an Angle lock is set the cursor is locked into that path, the Menu is not accessible to switch it off or make another selection. To free this restriction, hold down R.

EXIT To switch off the lock, release the cursor by holding down R and moving the cursor to '0-90'. When the legend flashes, press L and move the cursor.

3.32 GRID LOCKS

FUNCTION This function provides grid overlays to the Work Page and constrains cursor XY movement to the grid points.

OPERATION The default grids are both automatically sourced from the Work Page centre.

Move the Dynamic Cursor to the 8x8 or 4x4 legend. The legend will flash when selected. Press L and withdraw the cursor. The legend will stop flashing, but will remain illuminated while the lock is on. The grid will be generated and the cursor becomes restricted in its movement to the defined grid locations.

The lock can be overridden at any time by holding down R. When R is released, the cursor will lock onto the nearest grid point.

EXIT To switch of the Grid Lock and erase the grid, move the Dynamic Cursor (under R button override) to the 8x8 or 4x4 legend and press L. When the cursor is withdrawn the grid will be erased and the cursor freed.

3.33 POINT LOCK

FUNCTION This function allows you to establish a POINT lock sourced from the Origin Cursor.

SELECTION Move the Dynamic Cursor to the POINT legend on Menu 2 and press and release L. The Dynamic Cursor becomes locked at the Origin Cursor position. Press and hold R to release it from the lock.

OPERATION When selected the Dynamic or Copy Cursor is locked to the defined point in a similiar way to the Grid Lock.

EXIT To switch off POINT, press and hold R to move the Dynamic Cursor to the POINT legend on the Menu. Press L to cancel the function and then release R.

3.34 COPY AND ZOOM WITH LOCKS

The origin and size of the Copy and Zoom Cursors is always locked to grid points. This enables zooming up on a fixed proportion of the Work Page. The process can be repeated as many times as necessary to construct complex symbol based drawings at high resolution.

When used with COPY the Copy Cursor will be locked to the grid settings. Rotation is enabled in 90 deg steps. Scale can be adjusted in fixed grid increments (i.e. the Copy Cursor enclosing 2 x 2, 4 x 4, etc, grid blocks).

3.35 LOAD and EDIT

The two options, LOAD and EDIT, allow you to treat Library Units as collections of individual entries (as they were first compiled), rather than as a single module, (for which the COPY function is used).

Once loaded, therefore, the system reverts to the DRAW function and you can then continue working on the unit as a normal drawing (including erasing parts of the drawing).

Caution: These functions WIPE the Work Page before accessing the Library Index. Be sure to FILE the Work Page first if you want to save it.

3.35.1 LOAD

FUNCTION This function enables you to load a Library Unit from a Library Index for editing or amendment.

Note: If you have 'backed up' a drawing you are working on, use this function to retrieve the drawing for continued work.

OPERATION On selection, the current Library Index is displayed and the required Library Unit selected using the Copy Cursor. Press T to load the unit. Step back or forward using L or R to display the other Library Indexes.

The selected unit is brought from the Library and deposited automatically on the new Work Page at full screen resolution. You can then amend the unit as required saving the new version with the FILE function.

3.35.2 EDIT

FUNCTION This function enables you to isolate and load a Library Unit from the Work Page, for editing or amendment.

OPERATION On selection, the Work Page is redisplayed with the Copy Cursor framing the last Library Unit deposited. You can step back through the sequence of entries by pressing L or step forward by pressing R.

When the required unit has been identified, press T. The Work Page is then erased and replaced by the selected unit. You can then amend the Library Unit as required, saving the new version on the Library Index via FILE. Use EXCH to replace the new version for the old.

If the selected Library Unit contains lower levels of 'nested' Library Units you can repeat the above process to identify and extract a lower level unit for editing.

3.36 SCREEN IMAGES

These utility options deal with the display, storage, and retrieval of screen images i.e. the screen display at one moment during the drawing process.

3.36.1 CLEAR

FUNCTION This function enables you to view the Work Page without the Menu or palette overlays.

OPERATION On selection, both the Menu and palette are erased and the Work Page expanded to full screen size.

Note: The rescaling will cause the lower edge of the original Work Page image to be lost.

To store the Screen Image, you can directly enter the SAVE function by pressing T (see below).

EXIT Exit the function by pressing L and R simultaneously. Menu 1 and the Draw Palette will be redisplayed and the Work Page regenerated at base scale.

3.36.2 SAVE

FUNCTION This function enables you to store a Screen Image on the Library Disk for future use.

OPERATION On selection of the option you are requested to enter a name for the image for subsequent reference, e.g. PICTURE followed by the RETURN key.

The advantage of using SAVE is that more complex screen drawings can be generated than the available user memory can accommodate, plus the reloading of the image may be faster than the replay of a complex page.

Thus, a complex background for a drawing sequence can be created, saved as an image, and then loaded very quickly when required. In addition, these screen images are in the Apple picture format and are therefore usable with other compatible Apple software packages, such as SLIDESHOW PROGRAMMER.

Caution!: Since the SAVE function simply stores the entire screen contents rather than the drawing structure, it uses a great deal of storage space and should therefore be used sparingly. Designate some Library Disks for storage of images only to prevent restriction on the capacity of normal Library Disks for the storage of the Library Units.

Note:
Unwanted images can be deleted from the disk using the LIST function (see below).

Images can also be used as tracing overlays, since they do not form part of the Work Page data.

3.36.3 VIEW

FUNCTION This function enables you to retrieve a Screen Image from the Library Disk for viewing and output using PRINT if desired.

OPERATION On selection, you are requested to enter the name of the required image (previously reviewing the image names via LIST if necessary). Press the RETURN key and the selected image will be displayed on the Work Page.

3.36.4 PRINT

FUNCTION This function enables you to output the screen image to a compatable matrix printer. Use VIEW to bring in the required image.

OPERATION On selection, the screen is cleared and the image is printed.

Note: Certain printer interface cards provide various options when printing screen images. Image enlargement, rotation or inversion is often possible. Refer to the interface card user guide for details of any options available.

The appropriate control codes which may be required can be specified to the system by selecting 'User Configured' on the 'SET UP PRINTER° option in the System Menu.

3.36.5 LIST

FUNCTION LIST enables you to review the list of images stored on a Library Disk and, if wished, delete any images on the disk.

OPERATION On selection, the Image Catalog is displayed.

To delete an image, press T and enter the name of the image to be deleted.

When deletion is completed, the Work Page is re-displayed.

3.37 PLOT

FUNCTION The PLOT function allows you to exit the Main Graphics program and load plotter software.

OPERATION On selection, follows the disk change prompts given to load the plotter software.

3.40 SYSTEM INFORMATION

This section briefly presents some aspects of the internal design of the system to enable you to make the best use of the facilities provided.

The following topics are covered

Data Clipping

File Structure

Editing

Record Lengths

3.41 DATA CLIPPING

It may prove useful to understand the mechanisms in the system which decide what part of the graphic data is displayed for any given view.

The term 'clipping' means that the system examines the data it has to display at any one time, and 'clips' off material that would not be visible.

There are four clipping routines used. They are scalar, zoom view, library unit and individual data entry clipping. Optimise on display speed by bearing these in mind when compiling your drawings.

SCALAR CLIPPING

The purpose of this routine is to avoid delays which might occur when attempting to replay any graphics too small to be useful at the current zoom view. Four main parameters are involved.

Any text below 0.7 ASCII standard scale (default text scale) will be abbreviated to a field of dots. Any text larger then 8 times standard will also not be displayed.

Any circle with a radius of less than 1 screen point (pixel) will not be calculated and will be displayed as a dot.

Any Library Unit copied so that its base page view would be smaller than 4 x 3 pixels will not be replayed.

Any collection of data drawn under a zoom view such that the entire zoom view is less than 4 x 3 pixels at the current screen view, will not be replayed.

ZOOM VIEW CLIPPING

When you add data to the system it is always with respect to a given zoom view. If the original zoom view does not overlap with the current view, none of the data associated with the original view is valid at the current view and is therefore ignored.

Note: This is a very fast clip. Consequently, replay of zoom views of large drawings and schematics is enhanced if the data is compiled under several local zoom views, rather than being added to your base page view at small scale.

LIBRARY UNIT CLIPPING

As with zoom view clipping, if a given Library unit has an origin and scale which ensures that it cannot comprise part of the current zoom view, it is not replayed.

DATA WINDOWING

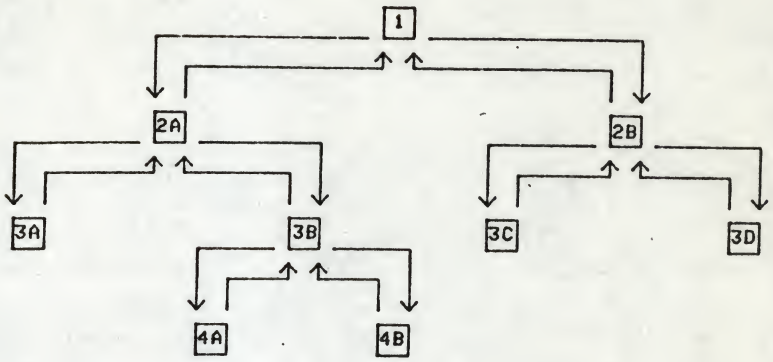
All data may intersect with the screen boundaries. The system calculates these intersect points and displays the valid part of the data. Replay delays can be caused by zooming intensively on the edge of a nib field, a large text block or a small part of a large block of stream.

3.42 FILE STRUCTURE

The system allows Library Units as part of the definition of other Library Entries, up to 16 levels deep. This powerful structure allows edit of library items globally (every instance of a given Library Entry) or locally (a single instance).

To take advantage of these options it is useful to understand the structure of a 'nested' entry. A typical file structure is shown below.

The system will process the file from the top down and from left to right. Thus, in this example the replay sequence would be 1, 2A, 3A, 2A, 3B, 4A, 3B, 4B, 3B, 3A, 1, 2B, 3C, 2B, 3D, 2B, 1.



COMPILING LARGE FILES

When generating a large drawing which will exceed the computer memory space it is useful to note the following procedure.

On reaching the limit of useable space (indicated by the memory counter located at the bottom of Menu 1) FILE the drawing. WIPE the system and then COPY it back using the default grids to get it full scale screen centre. The system substitutes a pointer indicating where the data is for the data itself, freeing the on-line memory for more drawing.

Note: The early part of the drawing can now only be edited as a single unit, unless you use the LOAD routines and work on it exclusively, saving the module back into the same slot on the library.

If the process must be repeated, use ERASE to eliminate the original Library Unit already filed, then FILE only the new data added. Thus the drawing is composed of two 'equal' parts rather than one being nested within the other.

After a WIPE, COPY back both components if there is a need to view them as an aid to continuing drawing.

Each Library Unit can then be considered as an overlay plane, to be added or erased at will.

This technique enables extremely large files to be constructed (up to disk capacity).

If you develop parts of the drawing separately as components (at as large a scale as possible), and only COPY them on to your finished work page as the final operation, you will achieve faster replay of zoomed views via the process of clipping.

3.43 EDITING

Every Library Unit has a unique definition based on the volume number, index and slot number of the library 'pigeonhole'.

When a library unit is updated (LOAD - change - FILE), every instance of that component is automatically updated on any drawing on that particular Library Disk.

To update a drawing with an edited component without affecting any other drawing first generate a new version of the component (LOAD - change - **FILE in a new slot**) and then use EXCH command to exchange the old component for the new edited version.

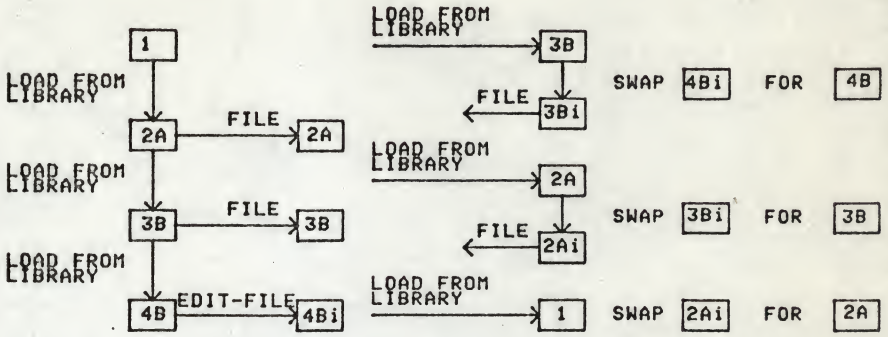
To uniquely edit an element of a component that is deep within its nested definition it is necessary to have access to all successive levels of the definition on the same Library Disk.
The procedure required is detailed below.

1 Use the EDIT function to load from your Work Page the complex component whose nested sub-assembly you wish to edit and file it on to a library.

2 Then as often as required LOAD, EDIT and re-FILE until a LOAD isolates the required level. Modify this and then FILE.

3 Then use EXCH to replace the old version with the new from the bottom of the nested definition upwards, re-filing as during the process. Finally, EXCH the old complex component for the new FILED version.

For example, to accomplish a unique edit of component 4B in the example file structure in Section 3.42.



Note: It is useful to keep those components which may require editing on the same Library Disk as the finished drawing. These can then be edited directly via LOAD and FILE (in the same box) which, as explained, automatically updates any successive nested definition with the new version.

3.44 RECORD LENGTHS

When compiling your drawings, each entry uses the following amount of memory, in bytes:

LINES	10
ARCS	15
CIRCLES	8
NIBS	18
PAINT	7
STREAM	4 + 4xn (where N = number of stream points)
TEXT	10 + N (where N = number of characters)
COPY	20

3.50 ERROR MESSAGES

This section gives the system error numbers and messages, describes what condition causes the error, and what recovery procedure to use.

If an error occurs, it will be displayed at the bottom of the screen.

1 WRITE PROTECT ERROR

CAUSE This condition occurs when an attempt is made to write to a disk which has a write protect tag.

ACTION Take the disk from the drive and remove the write protect tag. Replace the disk in the drive. Press RETURN key to continue.

2 I/O ERROR

CAUSE This condition is signalled if an attempt is made to access a disk drive where the drive flap is open, or the disk is incorrectly seated in the drive.

ACTION Remove and replace the disk, and ensure the drive flap is closed. Press RETURN key to continue.

3 LIBRARY DISK FULL

CAUSE This condition occurs if, when using FILE, there is insufficient space remaining on the current Library disk for a further library unit.

ACTION Remove the Library disk, and replace it with a new formatted Library disk. Press the RETURN key to continue, then FILE onto the new disk.

4 BUFFER DISK FULL

CAUSE This condition occurs when the Work Page being compiled exceeds the maximum space allowable.

ACTION The Work Page can be saved using FILE. No further entries can be added to the page without first erasing some.

Additionally, ensure that the Library Disk on which the Work Page is to be filed contains no other units, to avoid an Error 3.

5 NO MORE SPACE

CAUSE This condition occurs when memory user space has been exhausted.

ACTION FILE the Work Page being compiled. To continue compilation, COPY it back from the Library at SCALE = 100, (using a default grid to assist in proper placement), add further detail as required.

6 ILLEGAL FILE

CAUSE This condition occurs when an attempt is made to FILE a Work Page over an existing Library Unit, which is contained within the Page being filed.

ACTION Select another slot in which to FILE the Library Unit.

7 COPY TOO LARGE

CAUSE This condition occurs when attempting to COPY a Library Unit in Scale Mode, and the programmed scale of the Library Unit is too great to deposit the entry on the Work Page.

ACTION Either increase the Work Page scale or de-select Scale Mode and COPY under 'free-form' control.

8 FILE NOT FOUND

CAUSE This condition occurs when the system cannot locate a file on a disk. It can occur if the wrong disk is being used or a wrong file name has been entered.

ACTION Check that the file exists on the disk and re-enter the the correct file name.

9 SERIOUS SYSTEM ERROR

CAUSE This condition generally occurs when part of a drawing data file appears to be corrupted, or is missing.

ACTION Press the RETURN key to recover from the error. If this fails, press CTRL and RESET keys together to restart the system with the Work Page cleared. Then recompile the drawing(s) affected.